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Roadway Alterations and New Guildhall Offices, Bargate, Southampton.....Mr. R. M. Lucas, Architect.
Western Theological College, Bristol
Principal's House, Western Theological College } .....Mr. H. Dare Bryan, F.R.I.B.A., Architect.

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The Cheap Cottages Exhibition.—II.

WE concluded our first article on the Cheap Cottages Exhibition by noticing two out-lying semi-detached cottages designed by Mr. Baillie Scott, and which we presume are to form a portion of the permanent residences in the Garden City; at all events they are not of the class intended to illustrate the cheapest possible residence for the agricultural labourer. Continuing our way past these northwards, we come to one or two groups which are at a long distance from the main exhibition, which we shall find to contain some of the most interesting and promising of the houses on the ground.

Those which are numbered 66, 67, and 68 on the plan of the estate form a group apart, and we surmise that these also are permanent Garden City cottages. Nos. 66 and 68, still unfinished, are brick buildings of rather ordinary type, and are not included in the catalogue. No. 67 is a picturesque pair of semi-detached cottages, one of them inhabited, erected by the "Co-partnership Tenants' Housing Council" (London), who are Garden City tenants. These are simply designed cottages with 9-in. brick walls white-washed, and external wood-work painted green (this green on white seems to be the shibboleth of the day for the picturesque cottage), and red-tiled roofs. The claim made for these is that they "combine pleasing appearance with cheapness, comfort, and light," a claim which seems fairly made out; their appearance is certainly pleasing, and they must be fairly cheap, though that they can be built under ordinary circumstances for 300*l.* the pair seems to us exceedingly problematical. Compared with some of the cheap cottages of the exhibition they are in fact somewhat palatial in their proportions, and are clean, light, and cheerful internally. The inner walls are finished with Duresco. The fire-places (as in some other instances) are unfortunately disfigured with poor and quite unnecessary "ornament." As a matter of taste, things of this kind, in what is meant as a humble dwelling, cannot be too simple.

Skirting the northern boundary of the estate, westwards, we come on another group of which the first two form a rather significant contrast. One of these, occupying the site marked "Clough" on the plan, is a single cottage exhibited under the name of Mr. A. H. Clough, of Castletop, Burley, Ringwood, Hants, who is also the exhibitor of blocks 70 and 71 further; whether the bearer of this pleasantly familiar name and initials is estate-owner, architect, or builder, does not appear. This single cottage, a very small one, is of wood-framed walls with roughcast below and overlapped planking above, and partitions of 1-in. boarding simply, left with unpainted surface. The cost of this is stated at 110*l.*, and it is quite possible that it may be built for this, but it is not an erection calculated to promote the comfort of tenants or to form a very permanent property on an estate, and we should not advise any landlord to adopt such a construction; as a habitation, it is of altogether too bandbox a character; for a temporary shelter it would be well enough. Next to this is the concrete cottage designed and exhibited by Mr. Brodie, the City Engineer of Liverpool; as solid and durable as the other is the reverse, and which in a practical sense looks more like solving the problem of the 150*l.* cottage than most of them. The walls are made of concrete slabs of destructor clinker, slightly re-inforced with steel, 6 in. thick throughout; but the 6 in. in this jointless stuff should count more than 9 in. of brickwork. The experiment is so interesting that we may as well quote the considerations by which it is recommended in the catalogue:—

"The principle adopted in the construction of each room in the building has been that of a dovetailed box, in which each of the four sides, the floor, and ceiling of the rooms, is made of one concrete slab suitably reinforced with steel and made in a mould. After maturing, the slabs are conveyed to the site and erected in position.

Economy—due to utilisation of waste materials, small amount of labour throughout the various processes, rapidity of erection owing to the small number of pieces to be handled.

Advantageous arrangement of material in slabs—viz., rich proportion of cement in concrete, which is also compressed, used for outside skin where waterproof quality is desirable; poorer proportion of cement in concrete used for insides, which, being uncompressed and of a porous character, is suitable for taking a distemper wash or paper, without any further treatment.

Expense in woodwork reduced to a minimum, as, owing to the possibility of accurate moulding in concrete, the hinges of doors and windows can be screwed direct to the concrete. [They are not so, however, in this case.—ED.]

Long life of building.

Small cost of upkeep and insurance.

This system of building construction was

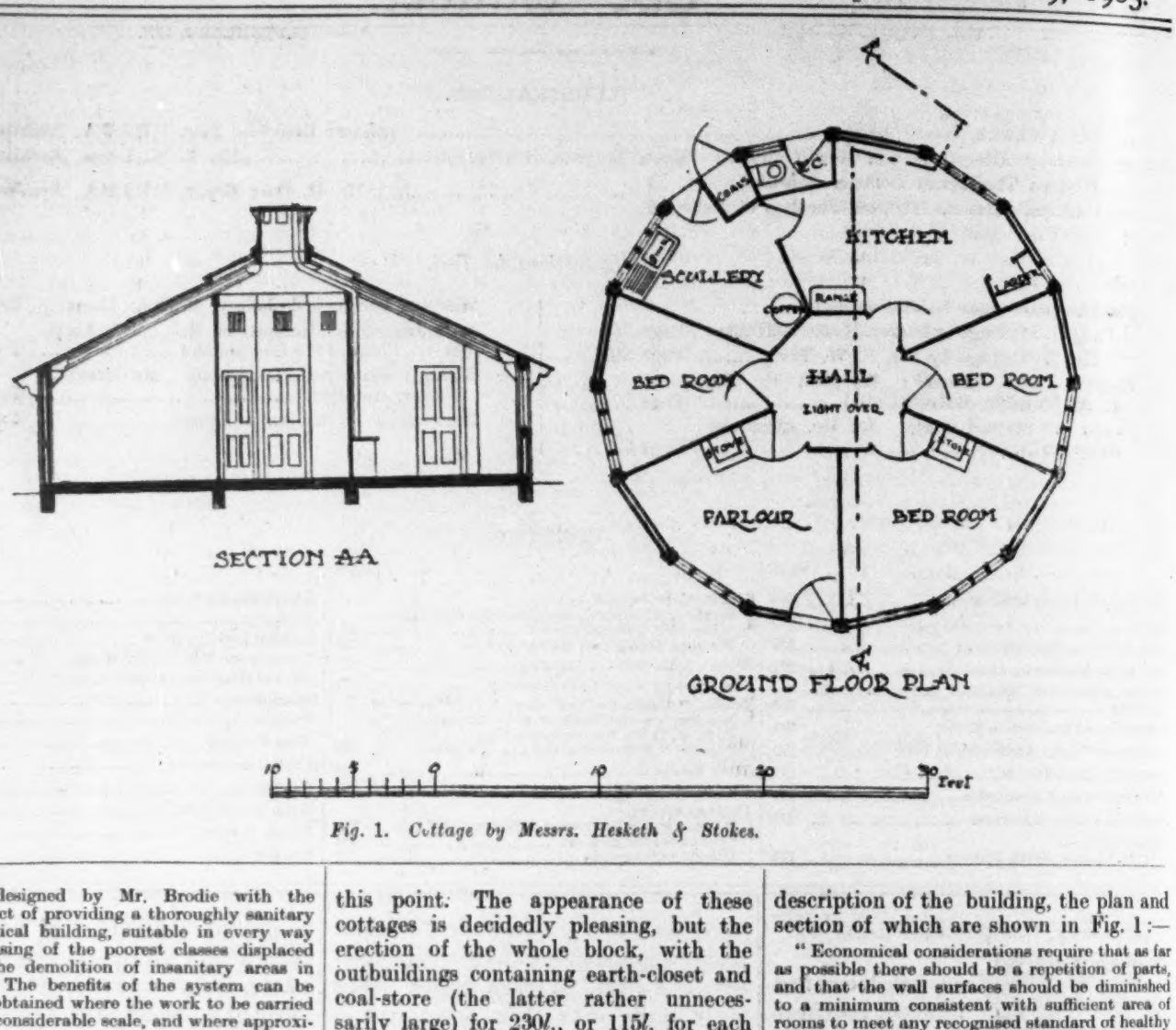


Fig. 1. *Cottage by Messrs. Hesketh & Stokes.*

originally designed by Mr. Brodie with the special object of providing a thoroughly sanitary and economical building, suitable in every way for the housing of the poorest classes displaced owing to the demolition of insanitary areas in Liverpool. The benefits of the system can be most fully obtained where the work to be carried out is on a considerable scale, and where approximate repetition in size of slabs is possible."

The interior is comfortable and well-arranged; the drawback is the external appearance. It is at the best a kind of construction better suited in appearance to town than country; this colourless concrete always looks poor in the country, and the attempt here made to give a kind of exterior design to it is not happy. It may be possible to make something better-looking out of it than this, by a different treatment; we may think it worth while to make the attempt; as it now stands it would be a very foreign body in a rural landscape. But it does seem more like the provision of a cheap cottage which shall be comfortable, solid, and durable than most of the others. The interior of the finished room is disfigured by a perfectly abominable "ornamental" grate; is this the sort of thing the Liverpool Corporation put in the dwellings they provide for their evicted residents? If so, it is enough to lower their moral tone still further.

Beyond this Mr. Clough exhibits two blocks, a single and a double cottage, with 11-in. brick walls with a hollow space. The double cottage is very compactly planned; the entrance is into the scullery, from which a 12 ft. living-room with a range is entered, and through it a third smaller room which forms a ground-floor bedroom, the upper story being divided into two pretty large bedrooms. The author draws attention to this arrangement, expressing the opinion that it is "more economical of space and cost than any method of placing three rooms over two," and there is something in this point. The appearance of these cottages is decidedly pleasing, but the erection of the whole block, with the outbuildings containing earth-closet and coal-store (the latter rather unnecessarily large) for 230*l.*, or 115*l.* for each dwelling, seems very doubtful. The remaining building of this group is a one-story cottage by the Darlington Construction Company. The walls are composed of 1-in. weather-boards, one layer of inodorous felt, and asbestos cement sheeting ¼ in. thick. "The result of an experiment carried out recently by the College of Science at Newcastle indicated that the above combination was equivalent, when temperature conditions were steady, to 9 in. of brickwork." We are not told the nature and details of the experiment; the result may be correct in a sense, but we can hardly regard this as calculated for a permanent abode for all seasons and weathers. It is the kind of thing to be described as a "shanty" rather than a house, and in the way it is treated here it suggests a temporary building for a country railway station rather than anything else. It is possible (as we shall see) to treat a building of this kind of construction in a much more suitable and picturesque manner than this is treated. Internally it is roomy and convenient. The cost, "erected on purchaser's foundations," is given as 150*l.*; and under that limitation it could probably be carried out for that sum. An unnecessarily high roof leaves a good deal of waste space over the ceilings.

In the next and larger group a little further on we find in No. 73, by Messrs. Hesketh & Stokes, architects (London), an interesting and ingenious experiment of a novel kind. The architects observe that the chief feature in this design is the economical employment of reinforced concrete. We may quote their description of the building, the plan and section of which are shown in Fig. 1:—

"Economical considerations require that as far as possible there should be a repetition of parts, and that the wall surfaces should be diminished to a minimum consistent with sufficient area of rooms to meet any recognised standard of healthy conditions. These two considerations led to the following conclusions, viz.:—(1) That the nearer a building approaches a circle the larger is its contained area; and (2) a polygonal figure of sixteen sides gives the required repetition of parts.

All the living-rooms, both in winter and summer, get direct sunlight into them. The upward slope of the roof from the walls gives an opportunity of ventilation towards the centre where the chimneys are collected into one. The inner hall gives convenient access to all the rooms in the cottage.

The walls are formed of two 2-in. slabs of concrete separated by an air space. The roof is formed with concrete slabs covered with slates, and the floor and foundations consist of a bed of reinforced concrete not less than 6 in. thick in any part, with wood floors to living-rooms. The divisions between the rooms are formed of 2-in. concrete slabs. The stoves to parlour and large bedroom are warm air grates of special pattern, giving warm fresh air to the adjoining bedrooms."

The architects deserve credit for a clever suggestion, and the system would certainly be economical of material and labour; but there is the obvious drawback that the plan produces rooms of a very inconvenient shape, and we do not think such a scheme is likely to be adopted, or that such a form of house would be at all popular among those for whose benefit it is intended.

The pair of cottages, No. 73, by Mr. A. J. Bateman, of Romsey, does not represent the cheapest class of cottage, but it is a substantial and well-arranged building, with two wash-houses, one for each dwelling, placed one beyond the other in a block at right angles to the rear of the houses, the earth-closets being placed again beyond these as part of the same block, so as to get them as far as possible from the living portion. The cost of the pair is put down at 300*l.*, but the exhibitor candidly adds that their erection at that cost is due to the fact

that, besides being a builder, he is also the manufacturer of the bricks, cement, hydraulic lime, roofing tiles, paving squares, etc., used on the building; and this, of course, puts it in an exceptional category. Mr. E. Clarke's cottage (74) presents nothing for special comment, except that the walls are described as "9 inches thick, built hollow"; but we are not told how this is carried out. The exterior face is brick, so it is to be presumed this must be 4½-in. brick with a thinner concrete wall inside; but the hollow space cannot amount to very much in that case, and would probably be better filled up. Throughout a great part of the exhibition too much faith is reposed in hollow spaces, the drawbacks to which are greater than their advantages. The walls are finished inside with cement, which, as remarked, "is more durable than ordinary lime plastering"; and attention is drawn to the fact that the windows open so that they can be cleaned from the inside, a point which is overlooked in many of the cottages exhibited, in which the upstairs casement windows, at all events, would be difficult to clean.

The next cottage, exhibited by the Wire-Wove Roofing Co. (though the wire-wove roofing is not employed in it) is an interesting and meritorious piece of work, though it belongs to what we call the "shanty" class of erection. It is very different, however, to the one to which we have already applied that term; it looks like a dwelling and not like a railway station office, and is a very workmanlike piece of timber construction. The walls are formed of over-lapping vertical 1¼-in. planks 8 in. wide, every alternate one recessed and over-lapped by those on each side of it; they are interlined with Ferol's sheeting and lined with matchboads covered with canvas and Halls' distemper. This is typical of the class of cottage which Mr. Allport, the manager of the Company, has for some time past advocated for estate purposes. It is a one-story cottage, well planned, with a living-room, scullery, and three bedrooms; there is a brick fireplace and chimney in the centre, as in the American frame-houses, and the two bedrooms adjacent to the fireplace side of the living-room have each a stove on a stone hearth in the corner, discharging into the centre brick chimney stack. Very little space being taken up by walls, the rooms are large, and the interior is well and simply treated. The cost is given as 150*l.*; we should doubt it being done elsewhere for that sum, but it is certainly not an expensive erection. We come round again however to the question, is this a kind of house for all seasons, and is it not likely to need a good deal of repairing? To answer the first question one must live in such a house through the winter, or take the evidence of those who have done so. If however, anyone wanted to build a sensible-looking summer bungalow as a holiday cottage, at a small cost, he could hardly do anything better than this; it is creditable in every way to the Company who exhibit it.

The case for the wooden cottage is put still more favourably in the one designed by Mr. F. W. Troup (No. 80). Mr. Troup is an artist, as many of our readers know, but he has also gone into this little problem in a thoroughly practical manner from his point of view. We give an illustration of his cottage (Fig. 2). It is supposed to be built on a concrete layer which, as the work is all light, would form a sufficient foundation. Everything is done to avoid little complications of construction; the roof in a single span running through, with no intersecting gable; the bedroom windows placed in the end gables, avoiding the expense of dormers. The walls are of 4-in. deal framing covered externally with weather-boarding and internally with lath and plaster. Is there a hollow space between the lathing and the weather-boarding, in the spaces between the framing? It is not apparent; but if so, that we think a weak point—much more so in a timber than in a brick building. Every inch of space is utilised inside, but without anything appearing cramped; indeed, the staircase is wider and more convenient than in many of the larger cottages. Two very nice bedrooms are obtained above, partly in the roof, and the architect points out that by the terms of many building by-laws these upper rooms must, under this roof, have been compressed to about 6 ft. wide, in order to obtain the orthodox height of wall at the springing of the sloping ceiling. The height is, it is true, only about 5 ft. on the side walls, but yet these are quite comfortable and habitable rooms. In the plan it will be observed that the bath, placed in the scullery, is arranged so that this corner could be temporarily shut off and produce a small bath-room, though it would ordinarily form part of the scullery. Mr. Troup does not overlook the fact that such a building would need repairs, but he suggests that everything is kept so simple that the village carpenter can do all that is required. The interior has been tastefully fitted up with plain and suitable furniture. In short, the case for the timber-built cottage could not be better represented, and the architect has kept fully before his mind the precise problem which the Cottages Exhibition was intended to solve.

The cottage No. 79, by Mr. A. Randall Wells, of Hastings, has good points. This is a building of 9-in. brick walls white-washed, with a roof of hand-made pantiles. The plan includes a small parlour to keep books and to relieve the crowding of the living-room; and in regard to plastering external angles have been avoided, and also large sheets of plaster for ceilings, owing to their liability to crack with the spring of the joists; the joists show and are plastered between. The hanging of the eaves gutter on the end of the rafters in the naked way adopted, with no eaves board and widely projecting eaves, would lead to the blowing about of rain-water against walls and windows in stormy weather, and looks rather too crude. This, however, is in the main a good cottage, but any one concerned in the economic question should compare this with Mr. Troup's cottage just mentioned, and note that they are both put down at 150*l.* It is obvious at a glance that if Mr. Troup's cottage costs 150*l.* to build, this one must cost much more.

Messrs. Smith & Brewer's cottage (No. 81) is another wooden erection of the same class as Mr. Troup's, and with the same merits, though not quite so good. It is furnished by Messrs. Heal & Son with their "Cottage Set in Oak," than which nothing could be more pleasing or more suitable for its purpose and position. The architects have aimed at the provision of as much space as possible in the living-room, adding a small bay window "such as may be seen in the old cottages of the neighbourhood," to give a little incident and a little more appearance of space. Next to this we come on a curious contrast to most of the others, in the block of two cottages—"Single-story Agricultural Labourers' Cottages," as built on the

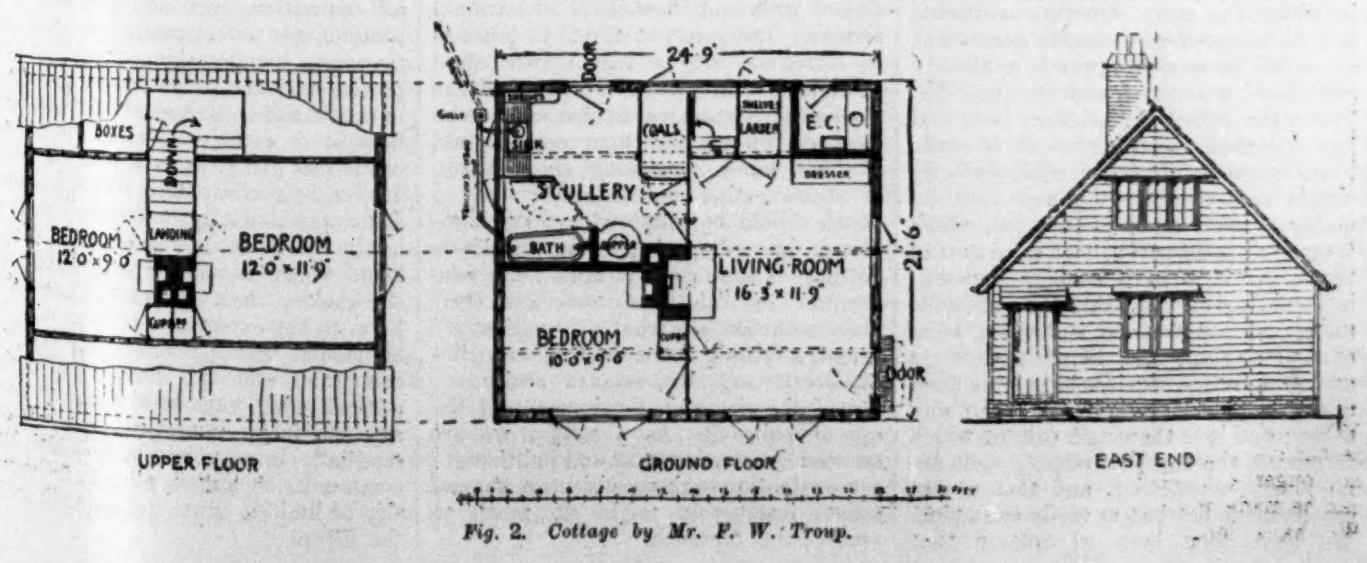


Fig. 2. Cottage by Mr. F. W. Troup.

Marquis of Salisbury's estate. Here we come for the first time on 14-in. brick external walls, the Marquis's architect clinging evidently to the old and perfectly sound opinion that this is the least thickness that ought to be admitted for an external brick wall of a dwelling-house. After all these thin walls the effect is almost monumental; but it is almost the only merit of this exhibit. The cottages are among the ugliest to be seen on the ground; in spite of the expenditure on walls, there is no place or provision for a bath, as will be found in many of the more slightly constructed cottages; and the sink is placed in the most awkward manner, thrust endways into a narrow space between the outer wall and projecting jamb of the main fireplace, so that only the end of it can be conveniently got at. These are stated to be 300*l.* the pair; if they are really built on the estate at this cost the information is important, as in that case it would appear that the thin walls prevalent everywhere in this exhibition are not a necessary concomitant of the 150*l.* cottage; but they do not show a satisfactory plan, as one of the three bedrooms can only be reached by passing through another. We question whether the one-story cottage is the best type; it is difficult to arrange the rooms satisfactorily without covering a good deal of ground. The cottage by the Society of Artists, the last of the row, is too pretentious for a labourer's cottage, and as to it being built for 150*l.*, we cannot credit that. The walls are of timber post and pan work (the long uprights somewhat too skimpy in proportion) filled in with concrete; the whole 6 in. thick. The plan is well arranged, especially the kind of exterior lobby or porch to scullery, with the coals and water-closet on each side of it; but the whole is hardly the type for a labourer's cottage, and seems out of place in this exhibition.

Near the railway is a group of cottages, in occupation, designed by Mr. V. Dunkerley, with whitened walls and red tile roofs, and with those sloping buttresses at the angles which Mr. Voysey has done most to bring into vogue; these give a character to a cottage, and are not uncommon in old cottages in Dorsetshire; but in new buildings they have no structural significance; they are only a matter of sentiment, and it is possible to get tired of them.

If one were to admit that buildings in which the main structure is timber can be accepted as desirable permanent structures on an estate (which, as already remarked, we very much doubt), Mr. Troup has solved the problem best, and has produced a cottage which is really pleasing and well arranged, while perfectly simple and unpretending and with no elaborate effort to be picturesque, which is the weak point pervading a great part of the show. If we have to end in condemning buildings of comparatively perishable materials, and demand something solid and permanent, Mr. Brodie's concrete and steel cottage provides it, in a practical and economical sense, better than any other; and it is the single exhibit which recognises the fact that sloping roofs are no longer a necessity, and that a roof can be made flat just as easily as sloping. We have long been of opinion that this facility afforded by concrete ought to be more taken into account in modern cottage building. Sloping roofs are picturesque and appeal to our associations, but they involve low walls to the upper rooms (in the case of more than one story), or loss of space and material in the roof. We admit that we think Mr. Brodie's cement cottage, as it stands at the exhibition, would be a most painful portent in a rural landscape; but the question is whether the material is not susceptible of a different treatment, without losing its practical value. Flat concrete roofing, moreover, may be applied to a brick-walled cottage; it does not necessarily imply concrete walls. One of the special problems in connexion with modern cottage building seems to be to design a concrete-roofed cottage that will not be ugly, even if the roof is flat. Can that be done?

NOTES.

Art and General Education. A CORRESPONDENT suggests to us that some general knowledge of the history and principles of architecture ought to form a part of general education in our schools. We agree with him; but we should go further, and suggest that some knowledge of sculpture, painting, and music should also form part of a general education. The English public, even the better educated section, are for the most part deplorably ignorant of the history and outlines of those arts. No doubt the answer, on the part of schoolmasters, would be that time is too short as it is for all that ought to be taught in a general school of liberal education, and that such an addition is impossible; but this ought not to be assumed too hastily, and without consideration as to whether there are not some studies which might be displaced to make room for a little general knowledge of the arts. We are not of those who advocate the displacement of Greek and Latin in our schools—in our opinion nothing can supply their place as the basis of a liberal education; but is the making of verses, which occupies so much time in many schools, a really necessary part of education in the classics? If one art only were to be made a part of a school curriculum, we agree that it should be architecture, not because it is the art we are specially concerned with, but because it is the one which is most universal and most interwoven with and illustrative of national history. But surely it should be possible to introduce into a school curriculum short and comprehensive primers of the three other great arts, so that a boy who has been through his school course should at least know something about them. It seems rather unsatisfactory that a youth should be supposed to have completed his education, and yet know nothing of the origin of music, nor who Josquin or Palestrina were and their place in the art, nor what a "symphony" is; nor anything about the characteristics of Greek and Renaissance sculpture; nor of the rise and development of the art of painting. As a nation we are artistically very ignorant and indifferent; some attention to these subjects in general school instruction might do much to remove this reproach.

The Panama Canal. IN their anxiety to push forward work on the Panama Canal the American Government made a serious mistake in commencing construction before the sanitary regeneration of the canal zone had been completely effected. The arrangement made with the Republic of Panama was that new sewerage and water supply systems should be established, and measures adopted for extirpating the mosquitos which perpetuate malarial and yellow fevers. It is true that the sanitary works were by no means neglected, but until quite recently they had not received sufficient attention, and were progressing simultaneously with construction on certain parts of the new canal. The result was that hundreds of the workmen and many of the officials were attacked by fever, and demoralisation began to spread among all ranks of the staff. Fortunately, the new Governor of the canal territory has reversed the previous policy, and with the aid of Colonel Gorgas, the health officer who took a leading part in the extirpation of yellow fever from Cuba, has concentrated attention upon the sanitary works. Operations on the canal itself are now stopped, and the whole of the men are engaged in making roads and footpaths, filling up swamps, cutting down thickets, and in completing the drainage and water systems. This new policy will not really have the effect of delaying the completion of the canal, for when the country is fit to live in work will be conducted on far more favourable terms, and in consequence with far greater rapidity.

Railways and the Rates. THE various reports of the railway companies and the statements made by the directors at the half-yearly meetings recently held, when they have had to meet the shareholders after a somewhat lean half-year, all testify to the steady increase in the burden the companies have to bear in rates and taxes, as well as to the fact that, in spite of adverse trade conditions, a continuous attempt is being made by the authorities to raise their valuations. Some of the companies have shown that the amount paid in rates and taxes now represents from 2 to 3 per cent. on their ordinary stocks. In times not very remote from the present these companies used to be regarded as powerful and dangerous monopolies, capable of crushing all opposition; yet now we find them brought into direct competition with the tramways, undertakings with running powers over the public roads, and which have not had to acquire the land for their lines at so much a yard as the railway companies had to do, and many of which are run by municipalities out of the rates: The depreciation in the ordinary stocks is hardly to be wondered at when it is a form of investment which makes the stockholder bear increased rates and taxes to the extent of 2 to 3 per cent. on his income, but it is remarkable that the companies and this large class of the general public have been unable to place any check on municipal extravagance, especially in view of the fact that the community at large is alive to the necessity of limiting municipal expenditure in the future.

The Witham Railway Disaster.

UNTIL the results of the inquiries being made into the cause of this lamentable accident are made known, it would be inappropriate to make any comment of an anticipatory nature. Serious railway accidents are comparatively rare in this country, but it is worthy of note that a considerable proportion of those which actually occur is due to derailment at curves. We all know that since the lines of our leading railways were laid down, considerable increase in the speed of trains has taken place, and it is only reasonable to argue that the curves which were suitable for former rates of speed are unsuitable for existing rates. It is probable, therefore, that the permanent ways of railways all over the country should form the subject of careful examination with the view of ascertaining whether the curves are such as afford reasonable security to the travelling public. Considerable improvement could doubtless be effected by remodelling sharp curves, so as to render them more suitable for the conditions obtaining in modern railway practice.

Steel as an Igneous Rock.

WHEN one speaks in general terms of the mineral matters of which the earth is made up—at least to such depths as have at present been attained—it is permissible to speak of them as "rock." But when some particular variety of mineral is in view, it is more correct to use the proper name for the substance in question. Thus, an engineer or an architect may refer to material which has to be excavated as rock, but in referring to granite and limestone on one hand, or to clay and sand on the other, the individual names are far more appropriate. The same applies still more forcibly to manufactured products such as iron and steel. Hence in describing steel as an "igneous rock" in his lecture before the British Association, Professor Arnold imposed a somewhat severe strain on modern terminology. The lecture itself, however, contained much instructive matter. Steel is probably one of the most complex substances extant, and the causes which lead to its unexpected failure, in perhaps one case out of ten thousand, still baffle metallurgists. As various failures show, this product sometimes behaves more like glass than as a ductile metal. The lecturer stated that researches made at Sheffield University proved that steel with a high elastic limit was as a general rule more liable to rupture than low-limit steel. In concluding, he urged that if Great Britain was to maintain her supremacy in the production of armour plate and projectiles, the scientific study of steel ought to receive far greater national recognition than had been accorded in the past. The same may be said of many other branches of investigation, and notably of those which are being undertaken in a small way by the National Physical Laboratory.

Friction in Pipe Bends.

ONE of the most practical papers contained in recent volumes of the Proceedings of the Institution of Civil Engineers describes the investigation made by Mr. C. W. L. Alexander at the University of Birmingham as to the resistance offered by pipe bends and elbows to the flow of water. For the purpose of these experiments, the bends and elbows were made of pine, carefully varnished with shellac, and rubbed down very smooth with glass paper. A length of straight pipe was also prepared for the comparison of results. The object of the experiments being to determine the loss of head for different degrees of curvature at different velocities, the curve of loss for a straight pipe was first ascertained per unit length. Then a table was prepared showing the loss of head at various velocities for a length of straight pipe equal to the length of the centre line of the different bends and elbows tested. When the losses for these had been obtained and plotted, the exact effect of each was clearly seen. It appears that the loss of head at a bend follows the same laws as those governing the loss in a straight pipe, and the obstruction does not cause anything in the nature of a shock until the bend assumes the form of a sharp elbow. For the formulæ derived by the author we must refer our readers to the paper itself, but may mention two interesting practical points. The first is that the curve offering the least resistance is one with a radius of 2½ diameters, and the second that the resistance of such a bend is 3·38 times the resistance of an equal length of straight pipe.

Electric Fuses.

THE paper on "Low Tension Thermal Cut-outs," by A. Schwartz and W. James, recently published in the *Journal* of the Institution of Electrical Engineers, will be useful to electricians. The "thermal cut-out" or fuse is a very simple device to protect electric circuits and apparatus from damage by large currents. It consists simply of a piece of thin wire placed in the circuit. This melts when the current attains a definite value depending on the gauge and material of the wire, and so ruptures the current. The simplicity of the device has probably prevented it from receiving the study which it deserves. Formerly tin and lead wires were almost universally used, but the introduction of higher pressures brought into prominence several defects of these metals. It was found that an arc was frequently established between the terminals when the fuse wire melted, and before the arc went out the fuse block was destroyed. In addition they were frequently found to be untrustworthy. The authors have found that one reason for this is the excessive oxidation of the surface of the metal, due to the use of very thin wire, which heats considerably at the normal current. They recommend that the fuse should be rated so that the normal current is only half the current at which the fuse melts. The present rating makes the normal current two-thirds of the fusing current, and hence the wire heats excessively and oxidises rapidly. This entails frequent inspection and replacement of fuses. We agree with the authors in considering that for the ordinary pressures used in practice the best open fuse is a piece of tinned copper wire of a suitable gauge, about 2½ in. long, held in a porcelain clipholder. With copper the arc is much less persistent than with tin or lead. From the point of view of the risk of fire it is essential that small fuses should not be interchangeable. In practice this is easily secured by the use of cartridge or plug fuses, but clip fuses can also be arranged so that a large fuse cannot be placed accidentally or otherwise in a circuit consisting of only a few lamps. The authors have found that when a fuse is placed horizontally it requires a larger current to melt it than when it is placed vertically, and that the larger the terminals to which the fuse wire is attached the greater will be the current it can carry. They have also made tests on silver and aluminium fuse wires, which are rapidly coming into favour on the Continent.

Victoria Falls and Electricity.

AN important discussion at the British Association meeting was elicited last week by the lecture of Professor Ayrton and the paper of Mr. Hammond, both dealing with the possibilities of the Victoria Falls as a source of electric power. No doubt these falls will some day furnish power for mines and cities scattered over an immense area, and a project is already on foot for utilising some portion of the power now running to waste. As Mr. Hammond remarked, there are no engineering difficulties in the way of supplying all the mines on the Rand with electrical energy, the main point for consideration being the cost of production and transmission. Until the demand has very largely increased in comparatively distant areas, it will probably be far more economical to establish central stations in the proximity of the places where energy is required, and where coal is both plentiful and cheap.

A Literary Museum for Edinburgh.

PROPOSALS are made for the establishment of a literary museum for the deposit of exemplars associated with the literary history of Scotland and the capital city. It is suggested that the old house, known as Lady Stair's, on the north side of the Lawn Market, might be appropriately acquired for the purpose. The house, bearing an inscription with date "1622," and standing between Lady Stair's and Gladstone's closes, had a garden reaching by a steep incline to the North Loch and at one time commanded a view of the Firth of Forth and the hills of Fife. It was the home of Eleanor, Viscountess Primrose, who married for her second husband John, second Earl of Stair, and having formerly played a notable part in the story of fashionable life in Edinburgh, is the scene of Scott's tale—"My Aunt Margaret's Mirror." Nine years ago Lord Rosebery purchased the house in honour of his ancestral relative, and employed Mr. G. S. Aitken, of Edinburgh, to restore the fabric to its pristine condition. The south and north wings, both being later extensions, had been pulled down some months previously, and two flats, of two panelled rooms a-piece, had been added at the building, in the XVIIIth century, of the adjoining James's-court. The extension of the north side contained in its lower basement a wine-cellar having bins formed of small Dutch bricks. In the course of reparation Mr. Aitken found that a floor had been inserted in the hall, originally two stories high; the

turnpike-stair from the door in the south-east angle, giving access to the vaulted basement and to the hall, was intact; on the north side of the hall were two rooms of which the upper one was entered from a gallery around two sides of the hall at the second-floor level; the hall retained fragments of a large stone fire-place, similar to that in Craigmillar Castle. Lady Stair's house was recently occupied, for temporary purposes, by the United Free Church of Scotland.

Art in South Africa.

Two years ago a project was opened for the encouragement of art in South Africa by way of founding an academy to provide a comprehensive education in the arts and crafts. The scheme had the support of many leading artists in this country, and is now assuming a more definite shape under the presidentship of Sir William B. Richmond, with Mr. Whale, of Cape Town, as vice-President. It is proposed to seek for affiliation to the Royal Academy, London, and for a Royal charter; and to constitute a Royal Academy for South Africa, to consist of twenty-four Academicians and eighteen Associates, to be elected in the first instance by the projectors and the Committee of the South African Society of Artists conjointly.

STEPS AND THEIR TREATMENT.*

THE subject for discussion embraces a wide area, and, if considered fully, would occupy more space than can be afforded in this paper. Stairs do not come within the scope of this paper, nor shall I deal with methods of construction. A consideration of the broad aspect of the architectural treatment of steps will, I think, provide sufficient matter, and within these limits I propose to confine myself. There are so many points to be considered, if the subject is discussed in detail, that it is impossible to deal effectively with more than general principles in a short paper such as this.

The variety of treatment to which simple steps lend themselves is as amazing as the endless melody to be obtained within the limits of a two-octave board. The scales upon which both are based are in a way parallel. The incidents and adaptations which produce the variety, however, are in the former cribbed within comparatively narrow limits.

The stepped pyramid at once lays down a fundamental scale upon which to fashion our compositions. The broad and simple conception forms a grammar of expression, beyond which we must not trespass too freely.

If we can fancy a monument at the apex of the pyramid, the steps or terraces assume a different meaning. Some Persian monuments are of this type, notably the tomb of Cyrus, which is raised upon the platform of a truncated pyramid.

In Central America the Teocallis, or houses of God, were built in a like manner, as were also many palaces. The palace at Palenque is an interesting example of a variation upon this treatment. The building is a simple parallelogram on plan, and is raised on a platform, which, instead of being stepped, is sloped inwards. Access is obtained by a huge flight of steps cut into the slope extending almost the whole length of the longer side. The Teocalli of Tusapan shows an attempt to add greater prominence to the steps as a feature in the design.

The Persians raised their palaces upon a base of great stone terraces, and each terrace was provided with two flights, the steps being set at right angles and housed into the wall at one end. The plan of the Palace of Persepolis shows this arrangement.

The use of steps in this way is always splendid, and their sober simplicity commends itself to the cultured and uncultured alike. The monument on a tumulus, or the city on a Tel, are each inspired by the same feeling. The conception being primitive is therefore reasonable. This layer-like arrangement of the base commended itself to the Greeks, and their appreciation of its value is shown in their use of the stepped stylobate to their temples. In this treatment is the use of steps made perfect as an integral part of the design. They are the plinth to the building. There is no other arrangement which could possibly be so satisfying, and it is impossible to imagine anything more reasonable.

Of course, the proportion of these steps was relative to the column of the order, and their convenience as footways was a secondary consideration. In the Temple of Zeus at Olympus, as in other examples, the large proportions of the steps forced the introduction of a minor flight leading to the central intercolumniation. In adapting Greek work to modern uses the difficulty must be got over in some such way. The portico of St. George's Hall, Liverpool, illustrates an effort—unsuccessful, I think—to solve the problem. Here there are three minor flights introduced, with the result that the breadth of line, which is the whole charm, is entirely lost. In the Olympus example the flight occupies only a very small part of the whole, and the dignity and rest of the base is not seriously affected.

Precedent in all things dies hard, and none more so than in architecture. The fragmentary retention of a feature which is beautiful because of its entirety is unwise. It becomes a makeshift, and is an unwarrantable mutilation of a beautiful thing.

This broad understanding gave way—by reason of demand—to a littleness of conception much in the same way as the beautiful serenity of Greek sculpture gave way to the pretty prettinesses of the sculptor's imagination.

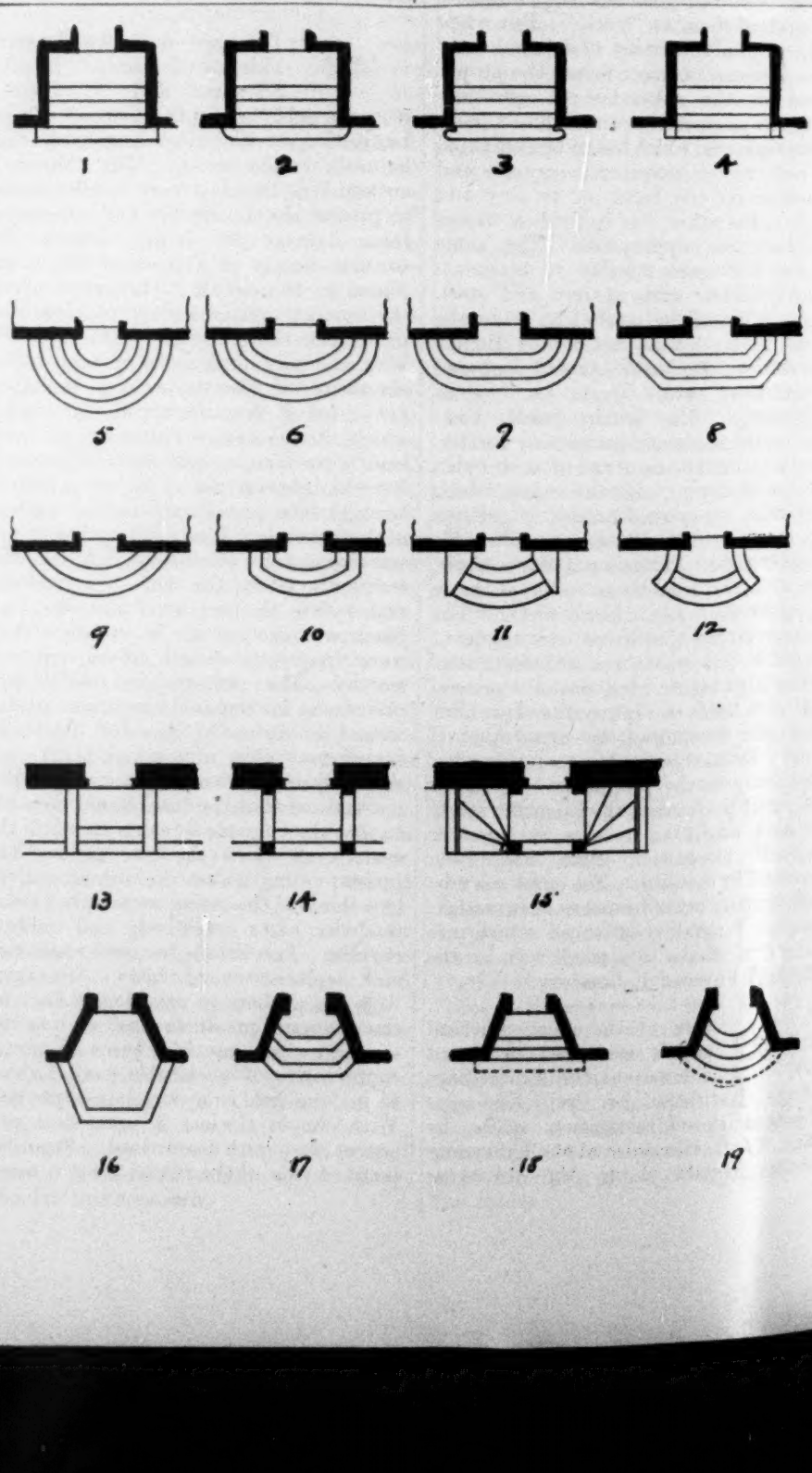
The Romans saw the difficulty and solved the problem by simply reducing the proportion of the steps. In the styles which followed the increased variety of buildings caused a still further breaking away. This broad feeling has never again been echoed except, perhaps, in those great buildings of mediæval times which were floored at the ground level, thus enjoying even greater inheritance. Steps became catalogued as a separate item in the minds of architects and were treated as such.

The stepped stylobate becomes more rare. There are a few later examples, however, notably the cathedral at Orvieto, which stands on a projecting platform surrounded by continuous steps.

Except in minor features, such as porticoes, returning steps were abandoned. Indeed, they departed with the peristyle which they served. Flights in one great line, extending the whole width of the façade, and protected at the ends, were substituted. The Temple of the Sun at Baalbec, the Madeleine (Paris), and the British Museum are some of many examples of this type.

A modification of this often occurs by breaking the flight into intercolumnar flights, starting the first step in line with the base plinth, as at St. Sulpice, Paris.

The great flights to the west portico at St. Paul's are a most satisfying treatment. The two great flights are treated differently; the lower flight returns on itself, and the upper flight is protected at the ends. The semi-



* A paper by Mr. A. C. Dickie, read before the Architectural Association Discussion Section on February 1 last.

circular steps to the north portico are equally satisfying. Here the effect of the unbroken rings is charming. It is much more effective than the south portico on account of there being eleven risers, instead of five, thus emphasising the feature more strongly against the intercolumnar steps.

The portico of London University, Gower-street, is a beautiful example of returning steps around the three sides.

In St. George's, Bloomsbury, the flight is contracted, and embraces only four of the six columns of the portico. The result is unhappy, and its meagreness detracts considerably from the general effect. The "New Church," Berlin, illustrates the same peculiarity.

The theatre at Malta shows an unusual arrangement. A parapet is carried across the front of the platform, and the traffic is divided by the returning flights at the angles, which are themselves sub-divided by the introduction of angle piers. From the landing reached by these flights the portico is approached by a broad flight passing through the intercolumniations.

The broad use of steps as a great street approach to a building is shown in the Piazza di Spagna, at Rome, which leads up in continuous flights to a landing, from which minor ways sweep to the right and left round to the entrance.

Stepped streets have a peculiar fascination, and there are no more splendid examples than those in the streets of Malta. They are arranged in simple flights, which vary in length as necessity demands. Seen from below the vista and the ascending figures on the great ribbed incline is an imposing and picturesque sight. Clovelly furnishes another example much nearer home. The way to the Colonna Romana at Brindisi is an example of the same without intermediate landings. There are many examples of what may be called the "public way" use of steps. The stepped way from the Temple area to the Pool of Siloam, at Jerusalem, is of more than usual interest. The steps near the Pool were originally cut in the rock, and are arranged in narrow and wide treads alternately. They are not at right angles to the rock scarp upon which they butt, and this peculiarity has been explained by Mr. Crace as a method to drag the traffic away from the unprotected edge of the Pool scarp. This would not, however, apply to ascending traffic.

The great flight of steps descending through the piers of the north aisle of a later church built over the street is an interesting and unique arrangement.

The Renaissance gives unlimited variations of the use of steps; some of them grandiose to the utmost extravagance and many of sober modesty.

In France the greatest freedom of line in planning is observed. Double O.G. flights occur in the court of the Louvre, and many more unreasonable forms are to be found elsewhere. The varying radii make it extremely difficult to preserve the balance of the body, and the effect is not sufficient reward for the inconvenience. The great double flight to the entrance of Fontainbleau is another specimen of this class. It has nothing to recommend it. Of itself it is a shapeless, ill-conceived mass, bearing no relation to the façade it so sadly mars. From the top landing you descend in devious ways, first round a semi-circle, then across a square landing, and finally you are screwed round a sharp O.G. almost into the opposite flight, where you scarcely know whether to stop or go up again.

Compare this with the steps to the Caprarola, which so admirably fit the building. In the directness and simplicity of the plan lies its propriety. A more elaborate use of the same is seen in the façade of Palais du Senateur. It will be difficult to find a more perfect adaptation of steps to building fulfilling in every respect the demands of the mind and the eye. It is part and parcel of the base story, and carries the harmony of the design through the whole width of the façade.

In an example at Monte Caprino the flights are arranged at either side of the façade, and the plain, raking sides of the step walls are used as architectural features flanking the design. The crude effect of this raking line against the perpendicular is cleverly got over by the batter in the wall from the junction of the step wall, and the perpendicular of the angle turrets. There is no over-straining, it is simply reasonable; the only effect required to bring the two into harmony being the introduction of the batter to the side walls.

The Giant's Staircase in the Court of the Doge's Palace is a beautiful and simple arrangement of two direct flights with intermediate landings. Personally, I confess inability to raise much enthusiasm for it as appropriate to the building. In spite of the most respectful consideration of it from all points of view, I cannot help doubting its propriety, and wishing it was elsewhere. It has the appearance of an afterthought. It lies awkwardly in the angle of the building, and the manner in which the steps are cut into the upper landing seem to indicate considerable scheming on the part of its designer to get over the want of space.

Michael Angelo's famous steps to the Bibliotheca Medici, at Florence, are the most strikingly original of all the endless varieties. The three flights side by side are fashioned by some uncanny skill and artistic power into a thing so fascinating that one scarcely cares whether it is of use or not. As a treatment in harmony with the façade, it is altogether satisfying. As a problem, it is most difficult of treatment.

At Siena is a staircase with two flights, the lower one returning round an octagonal column up to the landing from which the upper flight rises. Whether there is any practical reason for subdividing the traffic in the lower flight I do not know.

In a palace at Genoa is a flight of steps broken into three by the columns supporting the roof. The use of sculpture to get over the unhappy attenuation of the pedestal at the first step is the principal lesson to be learned here.

English domestic work provides many examples, especially in houses of the palace type. The artistic value of steps to houses and to terraces around these houses, as well as their uses in formal gardening, has been realised to the utmost. Flights are usually direct, and the segment is more common than the ellipse. The loose lines of the French examples are seldom seen, and I think we can lay claim to the fullest appreciation of the limits within which step design must be confined.

It is difficult to imagine anything more serenely beautiful than the steps to the garden front of Prior Park, Bath. The flights are divided at fitting stages, and the great sweeping flights to the first landing are used as a screen of the greatest value, both practically and artistically. The arrangement is altogether simple, and the effect of the great stepped height is retained, while its practical inconvenience is minimised.

Another well-known example is Lord Burlington's house at Chiswick. Here the problem and its solution are altogether different. The flanking zig-zag flights are very beautiful of themselves, but it is questionable whether they add to the beauty of the façade. The moving lines rob the base of its rest, the double bottom flights seem unnecessary, and it is worthy of discussion whether it is anything more than an interesting failure.

The steps to the orangery at Bowood House are dainty and beautiful. The straight flight is housed at the ends excepting the lower steps, which project from, and are turned back on to, the flanking pedestals.

I have sandwiched the Chiswick example between this and the Prior Park one to illustrate more clearly the dignity and restraint of both. They are entirely different problems handled by artists of entirely different architectural feeling. Both are evolved from identical reasoning. The Chiswick example differs from each of them as much as it differs from the façade which it serves.

The steps to Seaton Delaval are very ungraceful; they fit the portico badly, and look particularly dull and uninteresting.

The garden entrance to Highhead Castle, Carlisle, is a treatment perhaps more often used in smaller houses. It is less pretentious, and not so monumental as the others, but its quiet homeliness is charming.

The mural fountain at Bowood is an example of double segmental flights happily arranged.

In the smaller and more modern class of domestic steps the variety is proportionately great. I have drawn rough diagrams of some arrangements which are common. Figs. 13 and 14 are the usual London house steps; one is uncovered, and the other is covered by the usual portico. Both are equally appropriate. Fig. 15 is slightly more elaborate, and shows a double flight of wheel steps. This is from a house in Oxford-street, where a limited projection is allowed. I pass the house every day, and am always struck by the delightful privacy given to the entrance.

Let us suppose a doorway in a deeply splayed ingoing such as that shown. The first plan (16) shows the steps projecting from the opening and forming the other three sides of the hexagon. As the completion of the figure is not conveyed in actual execution, it becomes merely paper architecture, and falls with the rest of its class. Another method which is to be seen in old work is that shown in Fig. 17. The practical effect of this is to make it impossible for two to walk abreast, the mitres are awkward, and the uncertainty of the choice between the different faces is annoying. The next figure (18), which shows the straight filling of the space, is the most satisfactory arrangement, the nearest approach to which is the segmental form (19) shown next to it.

If steps are enclosed between two walls it is always awkward to have the bottom steps projecting beyond the face of the wall. A few of the commonest ways of making the best of it are shown (Figs. 1, 2, 3, 4), none of which look well. Semi-circular steps (5) always look well if they are not too numerous. When they exceed four or five in number they become obtrusive. Segmental steps to a large radius are objectionable on account of the unhappy line at their junction with the wall (9). This is sometimes got over by cutting the ends back on to the wall (10). An elliptical form (6) is more satisfactory than any of these when the number is considerable. In many of the Venetian examples this form has been adopted.

The proportion of tread to riser is given by Tredgold as 2 risers+1 tread=24 in., and I fancy some compromise of this is a safe standard. It is unnecessary to give figures and instances. Personally I believe that, if the tread is never less than 12 in., an inch out or in in the riser is not of serious consequence. Whatever they are they must be all alike in each flight. The astonishing readiness with which one instinctively adapts one's step to any particular proportion is reflected in the suddenness with which a change in that proportion is felt.

Steps should not only be safe, but they should also appear safe. It must be remembered that we not only go up, but we also come down. It is the descent which shows the defects. Even the most nervous can ascend without fear. To descend, however, where there is any degree of incident occurring causes concern in spite of the most intimate acquaintance. This uneasiness exists until the incident is past. The ideal descent is that which can confidently be made without thought or consideration of your footing. To do so the flights must be straight and the steps of equal number and proportion, and the landings of equal width.

A number of flights in one straight line, although architecturally imposing, have the disadvantage of appearing too formidable. In dealing with a problem such as this we must pay careful attention to staging. The more interest that can be added to each stage the less is the ascent felt. At the same time the effect of the great steep must be preserved as much as possible. Prior Park may again be instanced as a happy compromise of these two claims.

Zig-zag steps to a great height are altogether convenient, but never imposing. The man with a "heart" would much rather face the series of returning flights which decoy him to the top than he would a long straight ascent. The momentary rest which pivots him round the newel is a distinct relief.

The object of steps is to give access with the least exertion, and to provide egress with the greatest safety. This object must always govern architectural treatment; at the same time it must make terms with the broad laws which govern architectural expression.

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Steps of sufficient width on a segmental plan of sufficient radius are comfortable going, and one swings up or down with a feeling of equal pleasure and safety. Of all forms perhaps this is the most pleasant. There is something in the desire to see round the newel of a narrow, circular stair which draws you upwards like the cotton wool in a ventilator model. There is no other form which can allure men to such heights. This is departing from the subject somewhat, but it may illustrate the principle, which is the same in its more generous application.

A three-sided form to steps is undesirable unless the proportions be very great. The mitre is ominous and distracting.

Steps unprotected at the ends are not to be recommended. No matter how wide the flight may be, it ought to be as comfortable at the sides as it is in the middle. The same nervousness which turns one from a giddy height draws one instinctively to the centre of the flight. If not protected, steps should always be returned at the sides.

I believe that with some such fixed principle of step planning their fitness to the building would come naturally. The question of architectural treatment would then be comparatively simple.

Of course such an argument lays itself open to the answer that it is based upon a principle which disowns the responsibility of circumstances. The nature of the approach leading to the steps, the use of the building, and the many demands which militate against proper architectural conduct must be considered.

Let me say in reply an agreement that such-and-such a solution is the best that can be made under the circumstances is in no way an acquittal. It is only an excuse, and admits a makeshift. If one is confronted with a problem which imposes conditions beyond all sense of decency, surely the responsibility becomes limited. To arrive flea-like at certain levels in positions already fixed can only be done at the expense of one's self-respect, and is only possible by complete abandonment to these conditions.

The difference between the successful and the unsuccessful treatment of steps is that the former belongs to, and is an integral part of, the design, while the latter is an unfortunate appendix which, were it practicable, we should like to cut off.

It ought not to be felt that the building is only reached when we have arrived at the entrance landing. We ought to feel that, with the first step, we have already arrived.

A friend put the whole question in a nutshell the other day: "By some steps you wish to get there, by others you've got to."

Electric Light Bracket: Designed by Mr. C. A. Llewelyn Roberts.

AN ELECTRIC LANTERN.

THE electric bracket lantern here illustrated is executed in hammered iron pierced and engraved. The design, which is based on XVIth century Spanish ironwork, is by Mr. C. A. Llewelyn Roberts, and the work was executed under his supervision by Messrs. E. & R. Gittins, of Birmingham.

THE ASSOCIATION OF MUNICIPAL AND COUNTY ENGINEERS.

A MIDLAND Counties' district meeting of the members of the Association of Municipal and County Engineers was held at Kettering on Saturday, September 2. The business proceedings were transacted in the Carnegie Free Library.

Mr. W. Harpur (Cardiff), Past-President, occupied the chair in the absence of the President, and there were present Messrs. H. Richardson (Handsworth), hon. district secretary, T. R. Smith (Kettering), H. G. Coales (Market Harborough), W. R. Loche (Hemel Hempsted), W. A. H. Clarry (Sutton Coldfield), C. T. Jenkins (Finchley), W. B. Madin (Rushden), F. C. Cook (Nuneaton), J. P. Norrington, S. Turner (Ashby de la Zouch), J. W. Metcalf (Newmarket), G. W. Lacey (Oswestry), D. F. Diver (Desborough), W. O. Thorp (Malvern), G. Hodson (Loughborough), and R. S. Henshaw (Portland), members; A. S. Bradshaw (Bedford), W. C. Holloway (Kettering), H. Ellison (West Bromwich), and E. J. Gammage (Dudley), associates; J. R. Hadfield (Bedford), J. Julian (Cambridge), and F. W. S. Stanton (Westminster), graduates.

Mr. Mobbs, chairman of the district council, welcomed the members to Kettering and expressed the opinion that such meetings were of mutual advantage to the members and to the local authorities.

Mr. W. Harpur, in acknowledgment, said it was a great advantage to be permitted to visit towns and to inspect the public works.

On the proposition of Mr. G. W. Lacey (Oswestry), Mr. H. Richardson (Handsworth) was re-elected hon. secretary for the Midland Counties district.

Kettering Waterworks.

Mr. T. Reader Smith, Borough Surveyor, read a paper on Kettering waterworks and new storage reservoir. He said when, i

1898, the Kettering Urban Council promoted a Bill in Parliament to obtain power to compulsorily purchase the waterworks' undertaking from the company then owning them, it became very evident that it would be necessary before long to obtain an additional source of supply; estimates showing that at the then rate of increase in the water consumption the available surplus water would all be taken up in four years.

The works purchased comprised a storage reservoir of 160,000,000 gals. capacity, near the village of Cransley, with a gathering ground of 1,805 acres. The average rainfall on this area, as determined by the late Professor Symons for the arbitration, amounted to 26½ in., and the average of three consecutive dry years 21·2 in., leaving, after deducting 16 in. for evaporation, 5·2 in. available for collection, equal to a daily supply from this source of 581,932 gals. From this 35,137 gals. per day had to be deducted for compensation water, leaving 546,795 gals. per day available for supply to Kettering. There were also two well-pumping stations, together equal to 110,000 gals. daily, making a total available supply of 656,795 gals. per day.

The population of Kettering was then about 28,000, and the number of water consumers, estimated at 5·3 per house taking water, was 17,315; the daily consumption was 485,820 gals., leaving a surplus of 170,975 gals., which, with an annual increase in the daily consumption of 40,000 gals., would evidently not last more than four years.

The Council thus had early to consider the question of additional works, and in 1899 they engaged the late Mr. James Mansergh, M.Inst.C.E., to advise them as to what works should be undertaken, and to assist them in obtaining the necessary Parliamentary powers.

Mr. Mansergh's then partner, Mr. Geo. R. Strachan, M.Inst.C.E., soon after made a careful examination of the country in the neighbourhood of the Cransley reservoir, and from there as far as Naseby, where the River Ise rises, with the hope of finding a source which would allow of a gravitation scheme and meet all the requirements of Kettering for the next twenty or thirty years. No such position for a reservoir could, however, be found, the configuration of the country only affording very small collecting areas for reservoirs at a sufficient elevation for a gravitation scheme. Mr. Mansergh, therefore, recommended in his report that reservoirs should be constructed in two valleys immediately adjoining the present gathering ground at Cransley, the sites selected being at such levels that the water would gravitate to the Cransley works where the filtration and pumping would be done, the existing plant being enlarged from time to time as the water consumption increased.

The two collecting areas were almost equal, the Thorpe Malsor area being 1,330 acres, and the Orton area 1,360 acres. The estimated quantity of water available for the former was 399,000 gals. per day, and for the latter 397,500 gals. The average dry-weather rainfall for these calculations was taken at 20·8 in., which, after deducting 16 in. for evaporation, leaves 4·8 in. available for collection. This was a smaller basis than for the previous calculations, as it was considered that recent dry years had lowered the average.

The compensation water to be given to the streams was put at 115,340 gals. per day from the Thorpe reservoir, and 116,025 gals. per day from the Orton reservoir, these quantities being about midway between one-fourth and one-third of the total quantity available, and leaving for consumption in Kettering 283,660 gals. per day from Thorpe, and 281,475 gals. per day from Orton, or a total of 565,135 gals. per day from the proposed new works. The total available water supply for Kettering according to these calculations would thus become 1,177,166 gals. per day.

In 1900 the Council went again to Parliament to obtain the necessary powers to construct the works advised by Mr. Mansergh. These comprised the two reservoirs referred to—the Orton reservoir to have an embankment 27 ft. high, a capacity of 90,000,000 gals., and a top-water level of 360 ft. above O.D., with a main delivering the water at the Thorpe reservoir; the Thorpe reservoir to have an embankment 46 ft. high, a capacity of 140,000,000 gals., and a top-water level of 335 ft. above O.D., the delivery main from this to convey the water from both reservoirs to the Cransley reservoir. The Cransley reservoir has an embankment 32 ft. high, a capacity of 160,000,000 gals., and a top level of 298·5 ft. above O.D. At these works there were three filter beds, each of 500 sq. yds. area, and a pair of Worthington pumping-engines, each of a capacity of 500 gals. per minute, or 720,000 gals. per day for twenty-four hours continuous pumping, delivering water to the town through a 12-in. main, 4,400 yds. in length, the working head against the pumps being about 70 ft. Mr. Mansergh's scheme further provided for two additional filters, a filtered water tank of 100,000 gals. capacity, and additional pumps at Cransley; a high-pressure tower with tank of 100,000 gals. capacity in the town at Clover Hill to improve the pressure at the higher parts, with pumps for supplying the same for the present service reservoirs, and new trunk mains arranged to serve the town in three separate districts, one high level and two low level. The estimate for the whole was 126,500*l.*

The Bill, which cost the Council 3,291*l.*, received the Royal assent in July, 1901.

The award of the umpire in the arbitration for the price to be paid by the Council for the purchase of the works was 127,880*l.*, and when to this were added the company mortgage debt, expenses of the Act, arbitration, winding-up of the company, compensation to company's officers, and legal expenses, the total cost to the Council became 148,111*l.*, for works on which the total capital outlay by the company only amounted to 72,025*l.* This heavy expenditure, much in excess of the highest estimates that had been formed, together with a further expenditure of 40,000*l.* to which the Council were committed for electricity works in order to avoid the loss of their provisional order, and the formation of a monopolist company, made the Council anxious to delay these new works of water supply as long as possible. But the exceptionally dry year of 1902 made it evident that more water must be provided, and in November of that year they decided to undertake the construction of the Thorpe Malsor reservoir, that being the nearer of the two reservoirs to their existing works at Cransley, and appointed the author their engineer to design and carry out the works.

These works comprised an embankment, with culvert under, valve tower, overflow weir, and waste-water channel, and a culvert bridge at the upper end of the reservoir with raising the road crossing the stream there to keep it well above the top-water level of the reservoir which would back up to this point. Arrangements had also to be made to supply the village of Thorpe Malsor with filtered water as compensation for the loss of their existing supply of spring water by a ram working in the valley on the site for the new reservoir, and which would be drowned when impounding the water by the new works; also for the diversion of the drainage of the village of Loddington, situated a mile above the new reservoir embankment; and a caretaker's cottage was to be built at the entrance to the site.

The site of the works was three miles out of Kettering, in the valley adjoining the south side of the main road to Market Harborough and Leicester. The strata of the neighbourhood, and generally round Kettering and over a large portion of Northamptonshire and parts of adjoining counties, consisted of a series of beds of sands, sandstones, limestones, and ironstones, known as the Northampton sands; they formed part of the inferior oölite, and rest on the blue clay of the upper lias. The latter was locally a very thick bed of clay, much worked for brick-making, and had been worked on the reservoir site for clay for the puddle wall of the embankment.

The embankment would be 840 ft. long at the top, and 46 ft. high at the centre; the width at the top would be 12 ft., the inner slope 1 in 3, and the outer slope 1 in 2¼ for the upper half, and 1 in 2¾ for the lower half, with a level benching, or beam, 4 ft. wide, at the junction of the two slopes. A wall of puddled clay was formed along the centre line of the embankment, and would be carried up to within 2 ft. of the finished level. It was 6 ft. wide at the top, and had a batter of ½ in. to 1 ft., or 1 in 24, on each side to ground level, so that the thickness at ground level at the lowest part of the valley was 9 ft. 9 in. This was continued in the ground below, a trench being cut through the surface strata and sufficiently into the blue clay beneath to form a sound junction with it, the minimum depth in this clay bed being 5 ft. in the lower parts of the valley, and 3 ft. at the upper ends of the embankment.

The culvert for the draw-off pipes was placed in a trench under the embankment, cut in the ground part way up the north side of the valley so that it was completely enclosed in the solid ground and protected from stresses arising from settlement of the bank. It was of horseshoe section, 6 ft. diameter, constructed of two rings of brickwork in cement-mortar—one part cement to two parts sand—with a rendering of cement mortar ½ in. thick between the two rings; the inner ring was of Hamblet's blue wire-cuts made with radial sides to suit the curves. The brickwork was placed on a foundation bed of cement-concrete, and surrounded with the same material.

The inner end of the culvert terminated at a valve tower situated just inside the toe of the inner slope of the embankment. The position was determined by the draw-off valves for the main to Cransley, which were placed at 12 ft., 24 ft., and 36 ft. below top-water level, the arrangement being that the bottom draw-off, together with the compensation draw-off, which was 3 ft. lower, was placed in the fore-bay channel at the foot of the tower, and the next draw-off in the side 12 ft. higher, was just above the pitching on the slope on the embankment.

The construction of the Thorpe reservoir was commenced in September, 1903, and should have been completed by the end of March, 1905; but the work was much delayed by the wet season following commencement. It would have been completed early in August, but for a subsidence of a part of the embankment between the valve tower and the south end, which occurred at the end of May last. The embankment was then within about 7 ft. of its finished height; the lower portion of the outer slope had been roughly soiled, and on the inside slope some 1,500 yds. of stone pitching had been placed on the lower portion of the south end.

The first thing noticed was a local settlement of the puddle wall, which began to attract attention about the beginning of the last week in May, and, at the same time, the pitching began, apparently, to travel down the slope of the embankment and crumple at the foot. This continued during the week, and by the end the surface of the puddle wall had sunk about 5 ft., the inner slope had bulged outwards considerably, and several cracks appeared parallel to the line of the embankment for the length of the subsidence, but considerably transverse to this line towards the ends, and on the Saturday it was also evident that the ground immediately at the foot of the embankment on the inside was moving and crumpling up under the pressure of the weight of the embankment. As these movements continued to increase, the Water Committee, at a special meeting on the site the following Monday, considered it would only be wise to take further advice, and instructed the author to consult with Mr. Geo. R. Strachan, M.Inst.C.E., as to the best course to pursue.

The portion of the embankment affected by the subsidence was a length of 250 ft. between points 250 ft. and 500 ft. from the south end. In order to determine the nature of the movement at the foot of the inner slope, four lines of pegs, 4 ft. long, were driven into the ground, the first row near the foot of the slope, the second 10 ft. away from the first, the third 30 ft., and the fourth 60 ft., the rows being set out parallel to the centre line of the embankment. Observations had already been taken of the movement of the puddle wall, but a centre line of pegs was now put in and another line at the foot of the outer slope, as this side had bulged slightly, though no movement had been noticed at the foot. The pegs were accurately lined and levelled, and observations were taken on May 31, and June 1, 3, and 5. By this time the puddle wall had sunk another foot at the central part of the subsidence, making a total of 6 ft., and had

moved inwards 5⅛ in., making a total movement inwards of about 18 in. At the foot of the inner slope the pegs in the first line were opposite the central portion, and the subsidence had travelled from 8 in. to 11 in. up stream, in the second line from 5 in. to 6 in., and in the third and fourth lines from ½ in. to 1 in.; the general line of movement being not square to the embankment, but somewhat on the skew, away from the steep side of the valley at the south end, and towards the centre line of the reservoir. There was also some alteration in the level of the pegs.

It appeared from these observations that the ground was giving way under the pressure of the embankment, and moving bodily up-stream, and to stop the movement and secure the embankment Mr. Strachan advised that a line of piles be driven for a length of about 200 ft. parallel to the foot of the slope, and about 20 ft. away from it, and that a heavy toe be formed over the ground extending about 25 ft. beyond the piles, and about 15 ft. thick, and that from this platform a new inner slope be formed against the original bank with a slope of 1 in 4.

No movement was observed for some time on the outer portion of the embankment, and it was therefore only proposed to add weight to it by flattening the slope below the 4-ft. beam 1 in 3½. Later there was a slight movement opposite the central portion of the subsidence, and it was decided to drive a row of close piling for a length of about 180 ft. on this side, also to ensure the safety of the bank. The whole of the piles had since been driven, and the alteration to this part of the embankment was now well in hand.

Mr. G. W. Lacey (Oswestry), in moving a vote of thanks to the author of the paper, referred to the heavy Parliamentary costs in connexion with the waterworks undertaking. The sum of 3,291*l.* seemed a lot of money to waste in obtaining powers to fulfil the duties imposed upon the local authority by the public health of the district. As to the subsidence of the embankment, he wished to ask Mr. Smith if he had discovered any cause for this which was not discernable by any bore-holes in the strata. It seemed peculiar that it should go at one point when the strata appeared to be the same throughout the valley. He took it that the piling had stopped any further subsidence.

Mr. J. P. Norrington (London), who seconded, remarked that the whole of the trouble at the reservoir must have arisen from some defect under the embankment. The question was largely a geological one.

Mr. Jenkins (Finchley) asked whether any borings were taken under the site of the reservoir, and, if so, what strata was found; evidently the strata was not stable.

Mr. W. L. Thorp (Malvern) said they were spending 23,000*l.* on new waterworks, and had to spend 2,000*l.* to 3,000*l.* in getting powers. When there was so much talk about municipal extravagance, he thought it time that Parliament took steps to lesson the burden of obtaining powers to do necessary work.

The Chairman said it was a crying shame that the cost of obtaining powers for constructing necessary sanitary works was so very heavy. He was concerned in a sewerage Bill which passed Parliament two or three years ago, and the Parliamentary expenditure in that case was 19,900*l.* That was a Bill which was opposed in both Houses.

The vote of thanks having been passed,

Mr. Smith replied to the questions which had been asked as to the subsidence of the embankment. He explained that the valley was flat-sided. They saw what was underneath in taking down their puddle trench, which was 20 ft. deep. It looked good enough to carry the weight, and that was proved by the down face of the embankment, which had not given. He could not say more about it than this—that the natural drainage having been cut off, the land became waterlogged, and had not proved equal to carrying the weight. The expenses they were now being put to were pretty much the same as if they had had to form concrete walls at the start. Mr. Strachan was there the other day, and he said it was in much better condition than he expected to find it. However, they were not satisfied with that; they were going to put a shaft down to test the embankment. They would start with the lowest point of the subsidence, and put the shaft down to the original ground below, so they would be able to see what had happened to the puddle wall.

Electricity Works and Refuse Destructor.

Mr. F. J. Bakewell, A.M.Inst.E.E., presented a paper on the Kettering combined electricity works and refuse destructor. He said the undertaking had so far proved very successful, in spite of the great depression in trade and the very keen competition which had been met with from the gas company. This success was partly due to the low charges for energy—namely, 4½d. per unit for lighting, and 2d. and 1½d. per unit for power—and partly to the Council's scheme of wiring consumers' premises, and supplying motors for a small rental, or on hire-purchase; the charges being 6 per cent. and 8 per cent. per annum for the wiring of houses and the supply of motors respectively, and 12½ per cent. per annum for either on a ten years' hire-purchase, these percentages being reckoned on the actual cost of the installations to the Council.

One of the chief advantages of this system of assisted wiring was that the Council's engineer could insist on the installations being wired to his own specifications, and thereby obtain a much better class of work throughout the town than he would otherwise have power to enforce. As a comparison between the relative cost of electric light and gas very satisfactory testimonials has been received from numerous consumers, pointing out that their bills for electric energy, both for lighting and power, had either come out less or very slightly more than their previous corresponding gas bills, although they had a much better light, with its numerous advantages.

The working costs of the station had been very satisfactorily brought down during the ten months ending March 31, 1905, and have been reduced from 4·5d. per unit sold in June, 1904, to 1·54d. per unit sold in March, 1905, averaging 1·76d. per unit sold for the whole ten months. Although the combination of the destructor with the electricity works was a decided saving to the Council as a whole, the working costs were not in any way reduced as far as the electricity works were concerned, but were, if anything, slightly increased, as the whole of the steam used from the destructor boiler was paid for to the public health department; and an extra amount of coal was used owing to one of the station boilers having to be always kept banked in case of the failure of steam from the destructor, although this extra was, as far as possible, taken into account in estimating the coal equivalent of the destructor. In order to obtain this coal equivalent very careful readings had been taken each month of the evaporation and coal consumption per unit generated of the station boilers, the amount of coal used per hour for banking, etc., and the evaporation per unit generated of the destructor boiler, whenever either had been used separately. From these results average figures had been obtained for the number of pounds of coal used per unit generated by the station boilers, after eliminating the coal used for banking and for the initial raising of the boilers to working pressure, and the number of pounds of water evaporated per unit generated by the destructor boiler. From the results obtained, 8 lb. of coal per unit generated, and 70 lb. of water evaporated per unit generated by the destructor boiler, had been decided on; so that, by dividing the total water evaporated by the destructor boiler during each month by seventy, the number of units generated by destructor steam only were obtained, and, on multiplying this amount by eight, the nearest coal equivalent of the destructor steam for the month was obtained.

The total amount of coal saved by the use of destructor steam during the ten months ending March 31, 1905, worked out by the above method to 389 tons, at 11s. 10d. per ton, including cartage, which was equal to 230*l.* payable by the electricity department to the public health department, from which an amount, reckoned at 50*l.* per annum, was deducted for management and wages of men employed by the electricity works for attendance to the pumps, boiler cleaning, and other incidental work done on the destructor, etc.

The results obtained by the destructor itself had been very satisfactory, about 14 or 15 tons being destroyed per day by one shift of three men working ten hours per day in the summer months, and about 20 to 22 tons being destroyed in the winter months by two shifts of two men working eight hours per shift. In order to obtain these results, the destructor had to be shut down for two and a half days once in every four weeks in summer, and once in two weeks in winter for cleaning out the combustion chamber and flues. An interesting result of the high temperatures normally obtained in the combustion chamber was that the fine dust deposited there was solidified into a very hard mass, which had to be broken out with wedges and sledge hammers. It was very satisfactory to notice that the usual dirt and unpleasantness of the destructor, which was one of the chief objections of electrical station engineers to a combined works, had been very efficiently kept out of the engine-room and station boiler-house by the general arrangements of the works, and by having the whole of the destructor department thoroughly swept and washed down every day.

Mr. T. R. Smith also contributed a paper on the electric light and power station and refuse destructor at Kettering.

On the proposition of Mr. G. W. Lacey (Oswestry), seconded by Mr. H. Richardson (Handsworth), a vote of thanks was accorded to the authors of the papers.

The members had luncheon together at the Royal Hotel, and the afternoon was devoted to inspections of the electricity station and the new reservoir.

ARCHÆOLOGICAL RESEARCH IN EGYPT.

We have received the following circular from the "Egyptian Research Account," which we reprint in hopes that the subject may thus be brought to the knowledge of some of our readers who may not otherwise see this circular. We are entirely in sympathy with the objects of the "Egyptian Research Account." The need for something like a British Archæological school in Egypt is even greater perhaps than in Greece, as the field is wider, and is at present less occupied:—

"*The Egyptian Research Account and British School of Archæology in Egypt.*—The Egyptian Research Account was started eleven years ago in connexion with the Chair of Egyptology at University College, which had been established by the late Miss Amelia Edwards. The purpose in view was the assistance of students who offered to work in Egypt, and it has been the means of helping most of the students who have worked there with Professor Flinders Petrie. Of these students a dozen are now in various official and other positions, to which this work has led them.

It has sometimes been remarked that there is no British School of Archæology in Cairo, as there is in Athens and Rome. Such a school has, however, existed for many years past in fact, though not in name, and has succeeded in giving students the practical experience which has enabled them to become successful workers.

The actual results justify the committee in considering that the time has now come to define the work as the British School of Archæology in Egypt. There is not the same need for establishing a building in Cairo, and locating the school there, as in Athens and Rome. The seat of the school must always be on the actual scene of work. Its centre in England will be University College, London.

In view of recent changes it is now intended that the Research Account should not only assist students, but should step into the wider field of providing also for the excavations of Professor Flinders Petrie. The means of support for his studies in Egypt during the last few years having lately been diverted to other work, the continuance of his researches will now depend entirely upon the contributions to the Research Account. His excavations have led to the discoveries of the pre-historic age of Egypt, and the systematic knowledge of its development; the history and civilisation of the early dynasties; the scientific accuracy of the great pyramids; the Semitic worship in Sinai; the earliest monumental record of the Israelites, and their later connexion with Tahpanhes, beside opening up the main sources of papyri in the Fayum and Oxyrhynkhos, and the series of Græco-Roman portraits. The rise of civilisation in the Mediterranean has also been revealed, each age in advance of the results of explorations in Greece lands, with which they have afterwards been linked Naukratis and Daphnæ, the Mykenæan art at Tel el Amarna, the Kamares pottery of the XIIth dynasty, the earliest painted Greek pottery of the Ist dynasty, and the western pottery of the pre-historic period, are the framework which has made possible a scheme of European history before the classical times. To carry on this course of discoveries, which have become the basis of our present view of early history, and to continue to train students in such historical research, is the purpose of the present movement.

This work will form a branch of the general development of research work in the expansion of the University of London, and, as it is entirely

dependent upon personal contributions, the committee appeals for assistance to all who care for the past glory of Egypt and for the sources of our western civilisation—to all who realise the continuity of history, and who wish to maintain the traditions of English discovery and scholarship in the East.

The annual volume, describing the results of excavations, fully illustrated, is given to each subscriber of a guinea and upward. The whole of the antiquities found, that are not retained by the Egyptian Government, are presented to public museums. No expense is incurred for management or for office.

Subscriptions or donations for the excavations and for the training of students must be addressed to the Secretary, Egyptian Research Account, University College, Gower-street, London, W.C."

"PEDIMENT" AS AN ARCHITECTURAL TERM.

THE seventh volume of the Oxford English Dictionary contains an interesting article upon the origin and history of this word. It has assumed many forms, from peremint, perimint, perriment, pedament, pediement, to piedment, all of them being, it seems, corruptions of pyramid, and not derivatives from the Latin *pes. pedis*. The Latin *pedamentum* was a vine-stake or prop; the Italian *pedamento* signifies any foundation, groundwork, base, or footing (Florio), senses with which, Dr. Murray observes, the modern pediment has no connexion. An early user of the term is given from the English version of the "Hypnerotomachia" (by Poliphilus, 1499):—

"The Coronices . . . were correspondent and agreeing with the faling out of the whol worke, the Stilliced or Perimeter [marginal note, a periment in corrupt English] or upper part of the uppermost Coronice onely except."

From Willis and Clark's "Cambridge" are quoted:—"A periment in the middest of the same wanscott" over the high table in the College Hall; "a phaine for the peremint of the Coundite," 1601-2; and (1603-4) "a Perriment on the topp of the organs with the scrowles and seven bowles for the same."

Evelyn, in his "Account of Architects," 1664, writes:—

"Those Roofs which exalted themselves above the Cornices had usually in face a Triangular plaine or Gabel (that when our workmen make not so acute and pointed they call a Pedament), which the ancients nam'd Tympanum."

Dr. Murray's note appended to the quotations contains the following remarks:—

". . . . Evelyn's word was evidently an attempted improvement upon the workmen's *periment* or *peremint*, which the translator of *Hypnerotomachie* considered to be corrupt English for *perimeter*. But the corruption of *perimeter* to *periment* is difficult to imagine, and the connexion of sense (see Willis, *Archit. Nomencl. Midd. Ages*, 37 *note*) is far fetched; and it seems more likely that *peremint* was a workman's corruption of pyramid, which a triangular gable sometimes resembles in section, and which is actually pronounced *periment* or *purriment* by the illiterate in some districts (*e.g.*, in W. Somerset:) at the present day. This would also better explain the "peremint of the Conduite" in 1601–2 above, since the Fountain in question had no "pediment" but a curved roof in form of an opee cupola. If this is the derivation, we have the *series*—pyramid, peremint, periment, pedament, pedement, pediment."

Professor Skeat ("Etymological Dictionary of the English Language," 1898) points out that *pedimentum* is not a Latin word, and he conjectures that the original word is *pedamentum*, a stake or prop for vines and trees, from *pedare* to prop, from the *ped* stem of *pes.*, whilst the spelling of pediment for pedament would naturally follow from confusion with the word *impediment*. He surmises that *pedamentum* was used as an equivalent to *pedatura*, a prop, and in Low Latin signifying a space of a certain number of feet, a site, or plot; but more light, he says, is desired as to the word's history. We may observe that in his "Glossary of Terms," etc., fourth edition, 1845, Parker cites *frontispizio* as the Italian equivalent to pediment, relating always to work in an elevated position, over porticos, windows, doors, and so on. Moreover, the synonymous terms ἀετὸς, ἀέτωμα, and δέλτα, or δέλτος; *fastigium* (used by Vitruvius); *giebel*; and *fronton* French and Spanish, support the great probability that our word pediment is not derived from the Latin *pes. pedis*.

TESTS OF CEMENT AND LIME BRICKS.—Some tests made at Purdue University, U.S.A., of bricks consisting of sand, cement, and lime, showed an ultimate compressive strength of more than 15,000 lb., as against 1,500 lb. for clay bricks of average quality, and 3,000 lb. for average facing bricks. The transverse strength of the cement and lime bricks was found to be upwards of 2,000 !

DESIGN FOR STAINED GLASS.

THIS design, by Mr. Alexander Gascoyne, was exhibited at the Royal Academy this year.

Mr. Gascoyne writes:

"The figure window of which you are reproducing the design is on Norman slab background, which gives a brilliancy and depth to the plain squares without interfering with the figure. The drapery is out of selected antiques, and painted lightly on the coloured portions, so as not to interfere with the natural quality of the glass."

Design for Stained Glass. By Mr. Alexander Gascoyne.

THE ARCHITECTURAL ASSOCIATION.

THE following is the list of fortnightly meetings of the Architectural Association for session 1905-6:—

Oct. 6.—Annual General Meeting. Address and Distribution of Prizes, by the President, Mr. E. Guy Dawber.
Oct. 20.—"London City Churches" (illustrated with lantern views), by Mr. Andrew Oliver.
Nov. 17.—"Old Manor Houses," by Mr. J. A. Gotch.
Dec. 1.—"Turkish Architecture" (illustrated with lantern views), by Mr. E. F. Reynolds.
Dec. 15.—"Church Towers and Spires" (illustrated with lantern views), by Mr. W. H. Bidlake.

1906.
Jan. 19.—"The Consideration of Sculpture by Architects," by Mr. F. Lynn Jenkins.
Feb. 9.—"Differences between English and French Gothic Art," by the Rev. G. H. West, D.D., A.R.I.B.A.
Feb. 23.—"Porches and Approaches," by Mr. F. T. Baggallay.
March 9.—"French Modern Architecture," by Mr. A. Vye Parminter.
March 23.—"The London Club House of Last Century," by Mr. A. W. Soames, M.P.
April 6.—"Valuations, Compensations, and Light and Air," by Mr. E. Greenop.
April 27.—"Fenestration," by Mr. Walter Cave.

AN OLD BOW CHURCH ACCOUNT.

THE following account of the cost of chimes and clock, and some other additions to Bow Church, is taken from the Harleian MSS. in the British Museum (4941: fol. 153). It is sent to us by Mr. Andrew Oliver. It is apparently undated:—

An account from severall Workmen of ye charge to make chimes in Bow Steeple a dyall into the Street and a Cupylow to the Vestry of the seyd Church.

To make Chimes compleat will require 24 Bells which to doo wd require 16 new Bells which will way 61cw. At 6 li per cw. comes to	366 00 00
To hang the sd bells without clapers will coste	70 00 00
To make chimes on these Bells will require a Brass Banch 4 foot 6 inches long 4 foot diameter and half an inche thicke will way allowing for waste 17 hundredweight with all other necessarys and workmanship	400 00 00
The hande into the Street will cost	120 00 00
And the paynting	50 00 00
A cupylow to the Vestry will cost	50 00 00
A Quartern clock to repeat only the Quarters	60 00 00
The Summ Total	1,116 00 00
To new Caste the 3rd 4th and 6th Bells to make them tunable and fit for chiming and for mending the mettle will coste	72 00 00
	1,188 00 00

Illustrations.

CHRIST CHURCH, NORTH BRIXTON.

THESE illustrations are copies of the working drawings of this church. Photographs of the completed buildings were published in the *Builder* of December 5, 1903, with particulars of its erection.

The drawings were exhibited at the St. Louis Exhibition, and at the Royal Academy this year.

ROADWAY ALTERATIONS AND NEW GUILDHALL OFFICES, BAR-GATE, SOUTHAMPTON.

THE work now nearing completion on the western side of the Bar-Gate comprises part of a roadway improvement scheme (illustrated in the *Builder* of October 12, 1901), which the architect (Mr. R. M. Lucas) put forward some years ago when the old gateway was in danger of being destroyed to make way for the electric trams. The arch between it and the new offices is as yet only face-work, for the brick wall under it cannot be removed until certain matters have been settled, so that the open way shown will not be made immediately. The upper part of the Bar-Gate has long been used as the town's Guildhall.

The drawing that we published in 1901 showed a simple widening of the two present side passages *under* the flanking towers; but, in a Note on the work then proposed, we explained that Mr. Lucas would prefer, if possible, to close these passages (made about 1770) and to form the new roads and pathways *outside* the towers, which would then stand solidly on the ground. Fortunately, through the opportune tottering of a public-house that till lately hid most of the north-west tower, it became possible so to deal with the site as to permit of adopting the preferred arrangement.

The new building makes no pretence of being mediæval in detail, but has been designed broadly on Gothic lines with particular regard to the ultimate composition of the extensive array of buildings which will eventually be opened up, with the unaltered Bar-Gate as their central feature. For this reason the walls towards the main street have been kept as plain and as free from openings as could be managed in order to allow the plain expanse of rough stone (Purbeck Roach) to have an unostentatious and reposeful effect. The skyline has been arranged to lead the eye to the magnificent overhanging battlements which are such a noble feature of the Bar-Gate; and imitative outlines have been carefully avoided.

The half-timbering is of framed Baltic oak, and the internal fittings are mostly of the same rugged material. The work is being carried out by Mr. F. Osman, contractor, of Southampton, under the joint supervision of the architect and the assistant borough engineer, Mr. W. H. Killick.

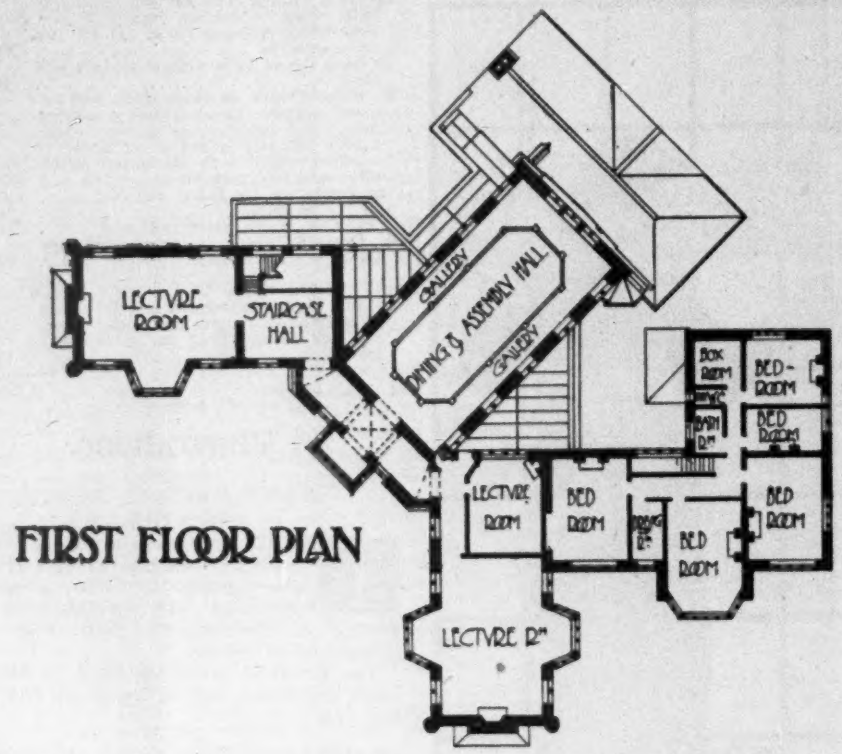
WESTERN THEOLOGICAL COLLEGE, BRISTOL.

THESE buildings are now in course of erection, and will be used for training students for the Congregational body; the college is a non-residential one, but the students and professors will dine together daily in the hall. The buildings are faced externally with Bath stone, with stone mullioned windows, and lead latticed glazing, and much of the interior finishings will be in oak. The roof is of specially-burnt tiles, the colour grading from buff at the eaves to reddish-brown at the ridge.

The heating is on the low-pressure hot-water system, installed by Messrs. Haden & Son, of Trowbridge; Messrs. Jacob Long & Sons, of Bath, being the general contractors; and Mr. W. H. Lewis the clerk of works.

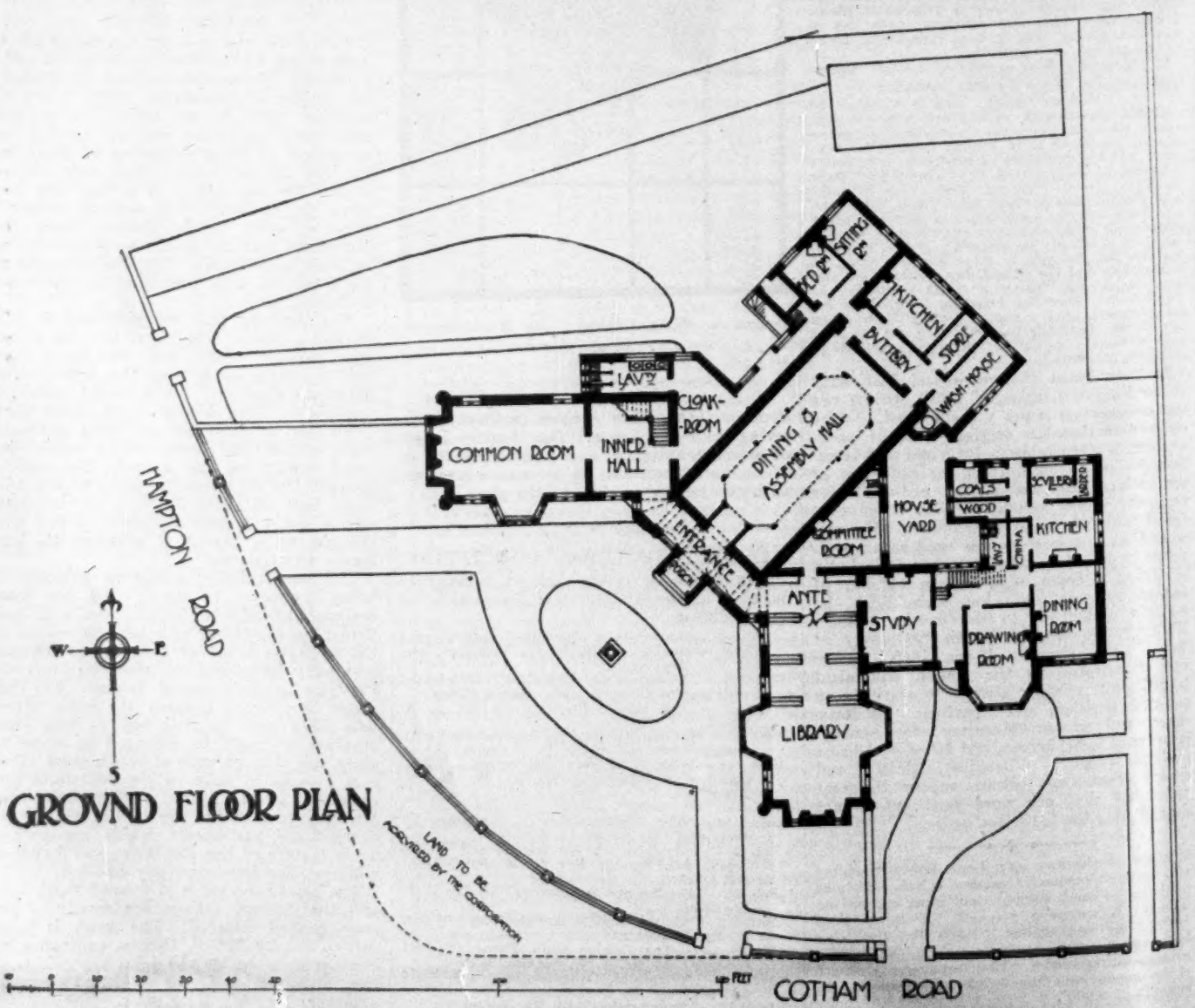
Since the drawing (which was hung in this year's exhibition of the Royal Academy) was executed it is proposed to carry up the porch and to substitute a lead flat and parapet for the sloping roof, showing between the two octagonal towers, so that the flat roof may be used, affording, as it does, a magnificent view.

H. DARE BRYAN.



FIRST FLOOR PLAN

CALGARY CEMENT WORKS.—Canadian newspapers report that the Portland Cement Company has been organised and the charter applied for, with a capital of 400,000 dollars divided into 100 dollar shares. A large number of the business men of Calgary have associated themselves with the company, as well as some practical men from Ontario experienced in cement manufacture. The location of this industry in Calgary, in the North-West Territories, means an addition to the population of about 300, and involves a monthly pay roll of about 6,000 dollars, as most of the employées are mechanics and receive a high rate of pay. It also means a cheap cement for construction of houses, sidewalks, and street pavements, reducing the cost of the above by fully 25 per cent. Building operations are expected to commence early this autumn, so as to enable the cement to be placed on the market next spring. The building will be absolutely fire-proof, the walls being constructed of concrete with steel roofs. For motive power the company propose using electricity, thereby doing away with shafting, belting, etc., which have always been the source of great loss and annoyance in the operating of cement plants. The cement plant will be on the dry process, with an initial installation of three rotary kilns giving a daily capacity of about 750 barrels. A rotary kiln operating on the dry system with rock and clay will turn out from 125 to 150 barrels of cement per day more than can be turned out from marl and clay, which the Ontario Cement Companies are using, with the same consumption of fuel, because of the excessive moisture to be evaporated from the latter. In other words, this one advantage over the Eastern cement means a direct saving of about 25,000 dollars.



GROUND FLOOR PLAN

Western Theological College, Bristol. Plans.

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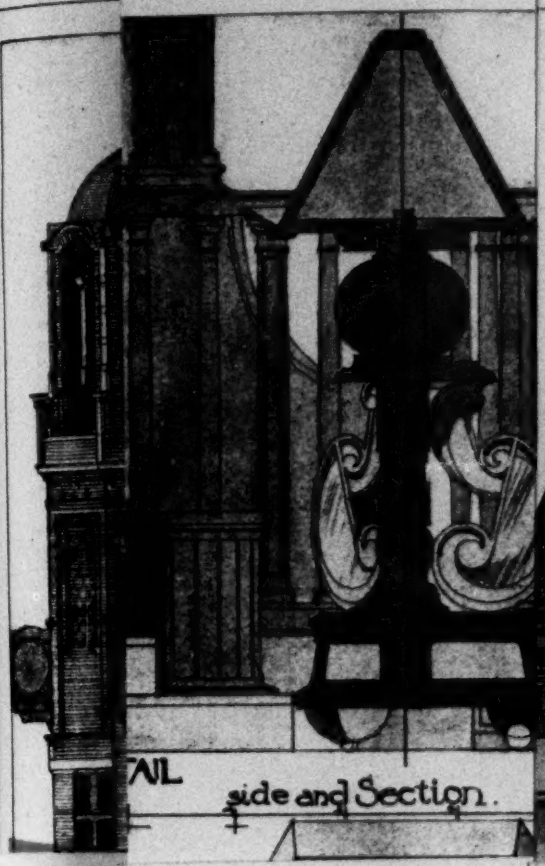

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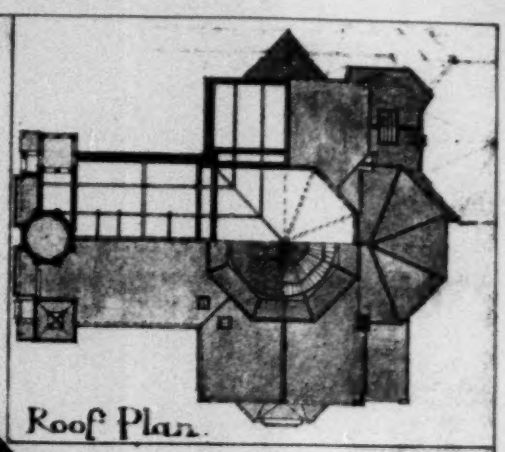
Side and Section.



Roof Plan.

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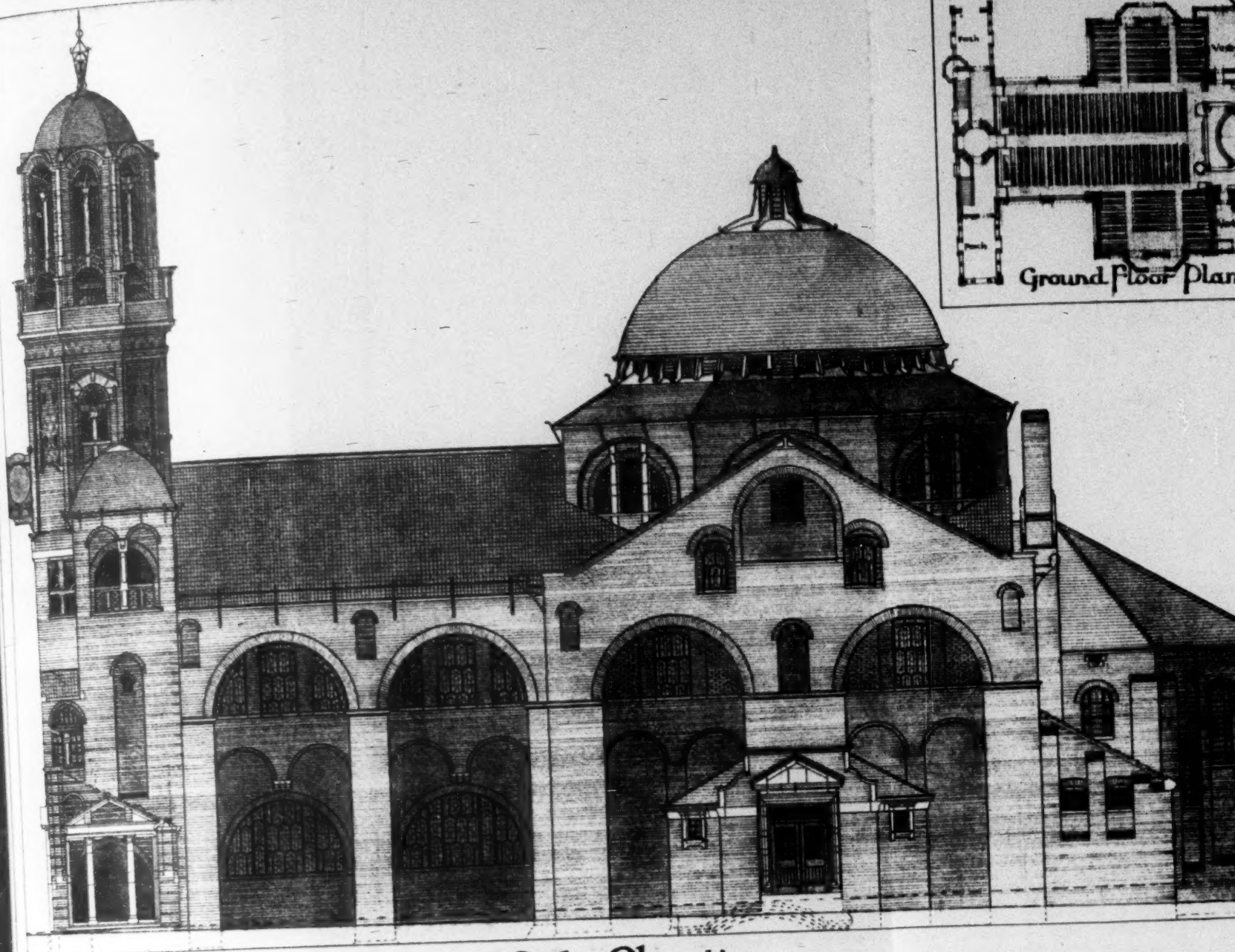
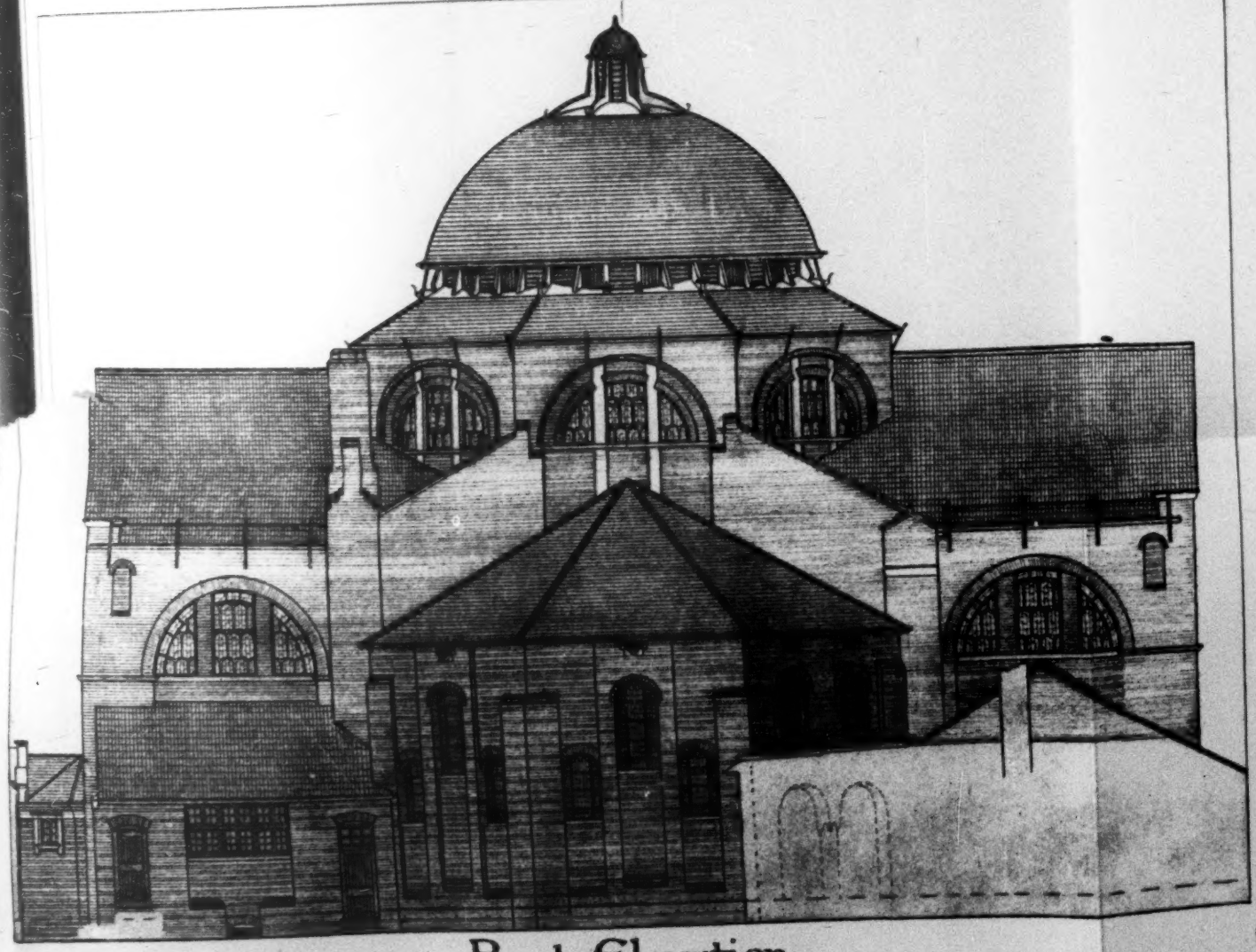


Side Elevation



Back Elevation

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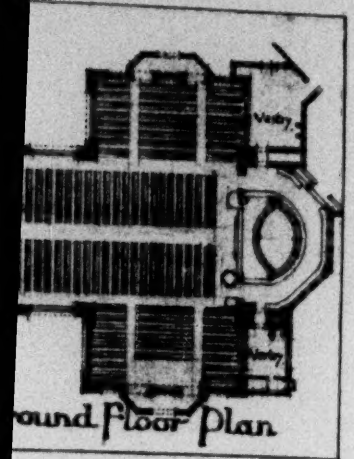

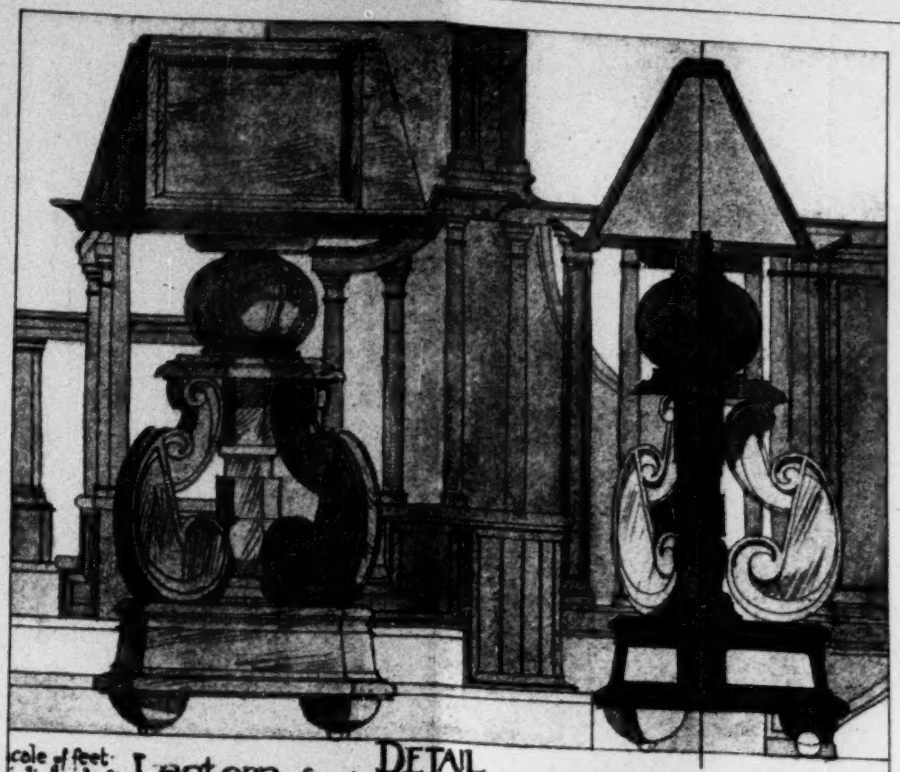

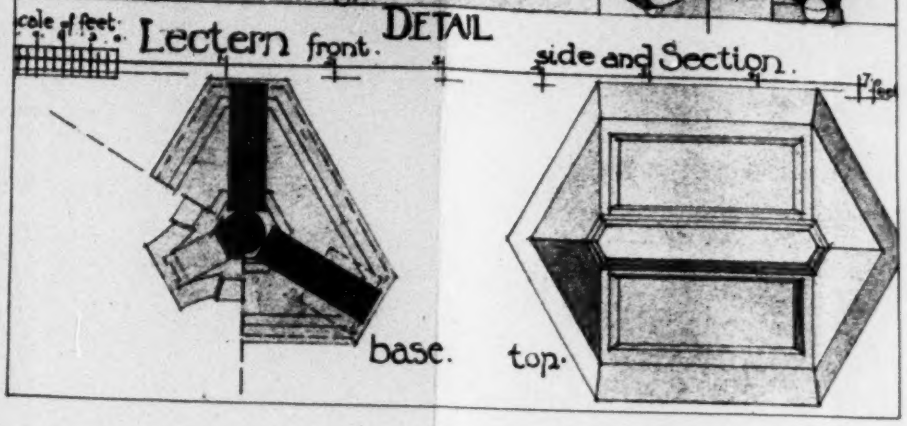

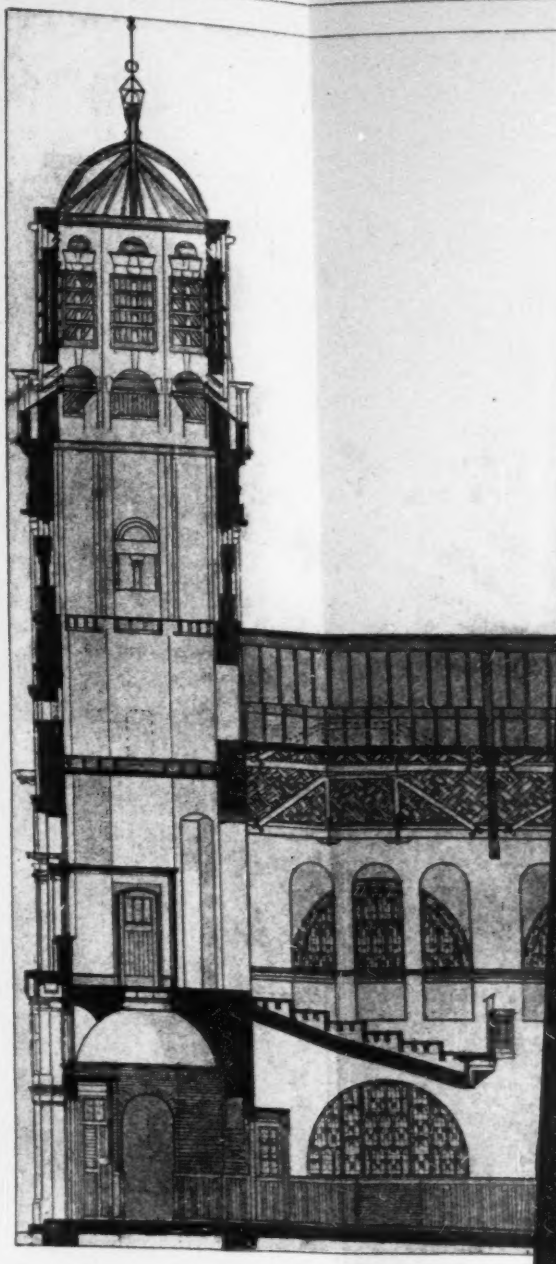

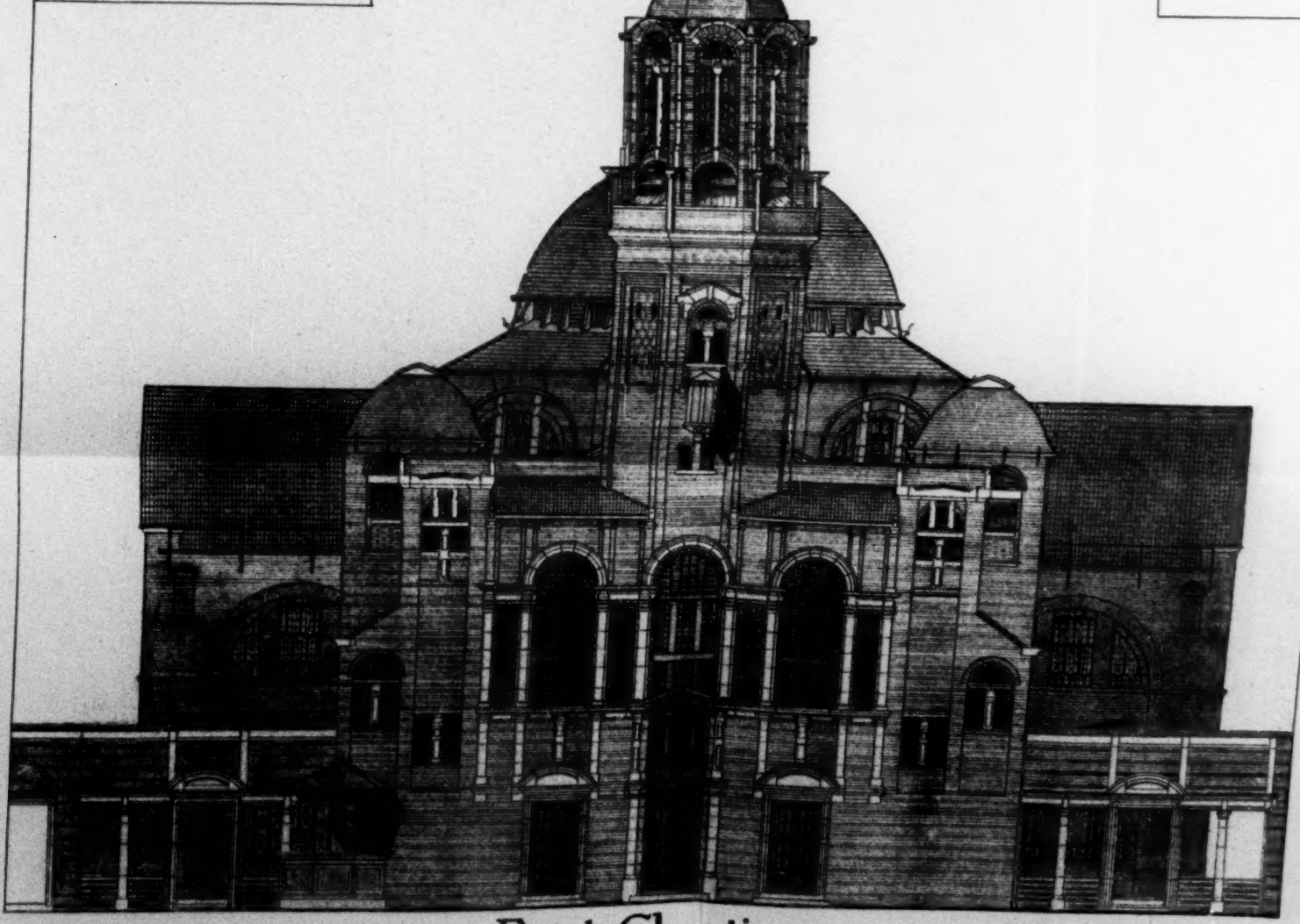

Front Elevation

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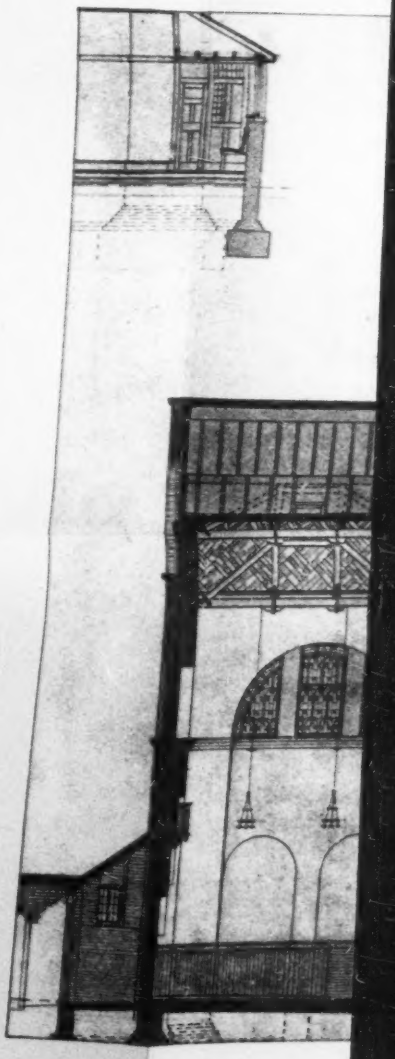
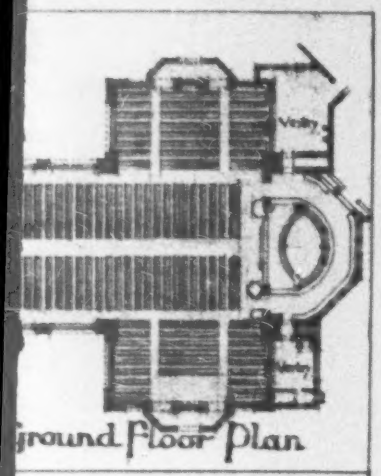
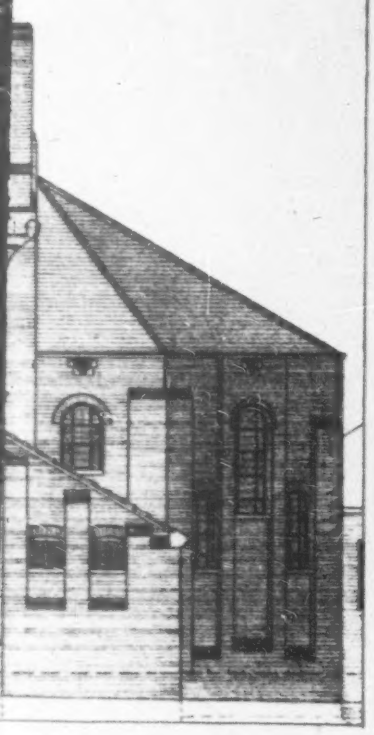
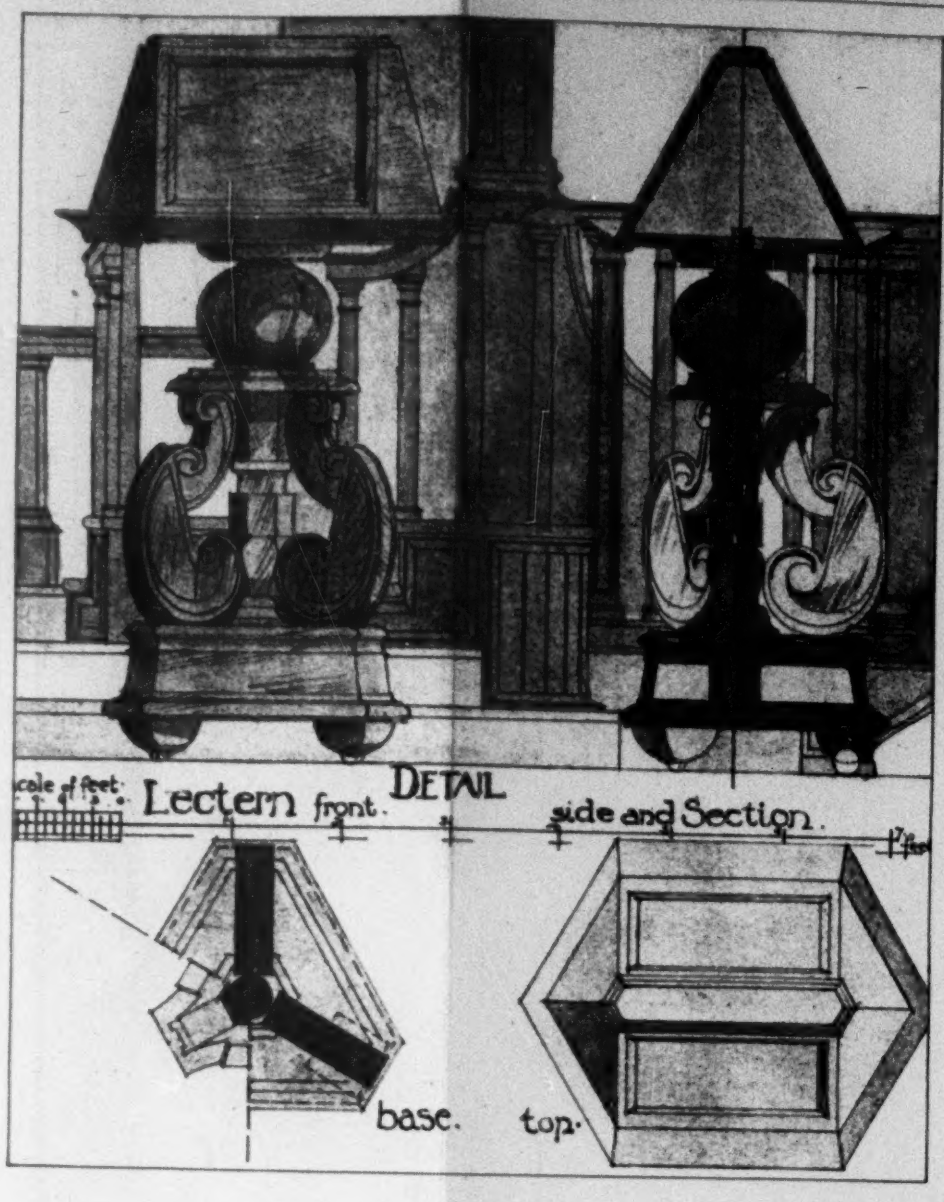
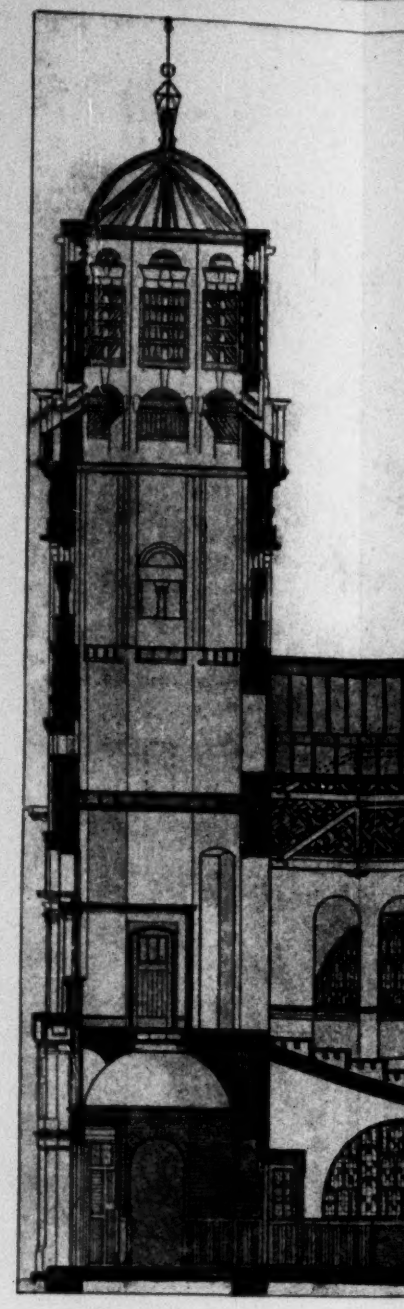


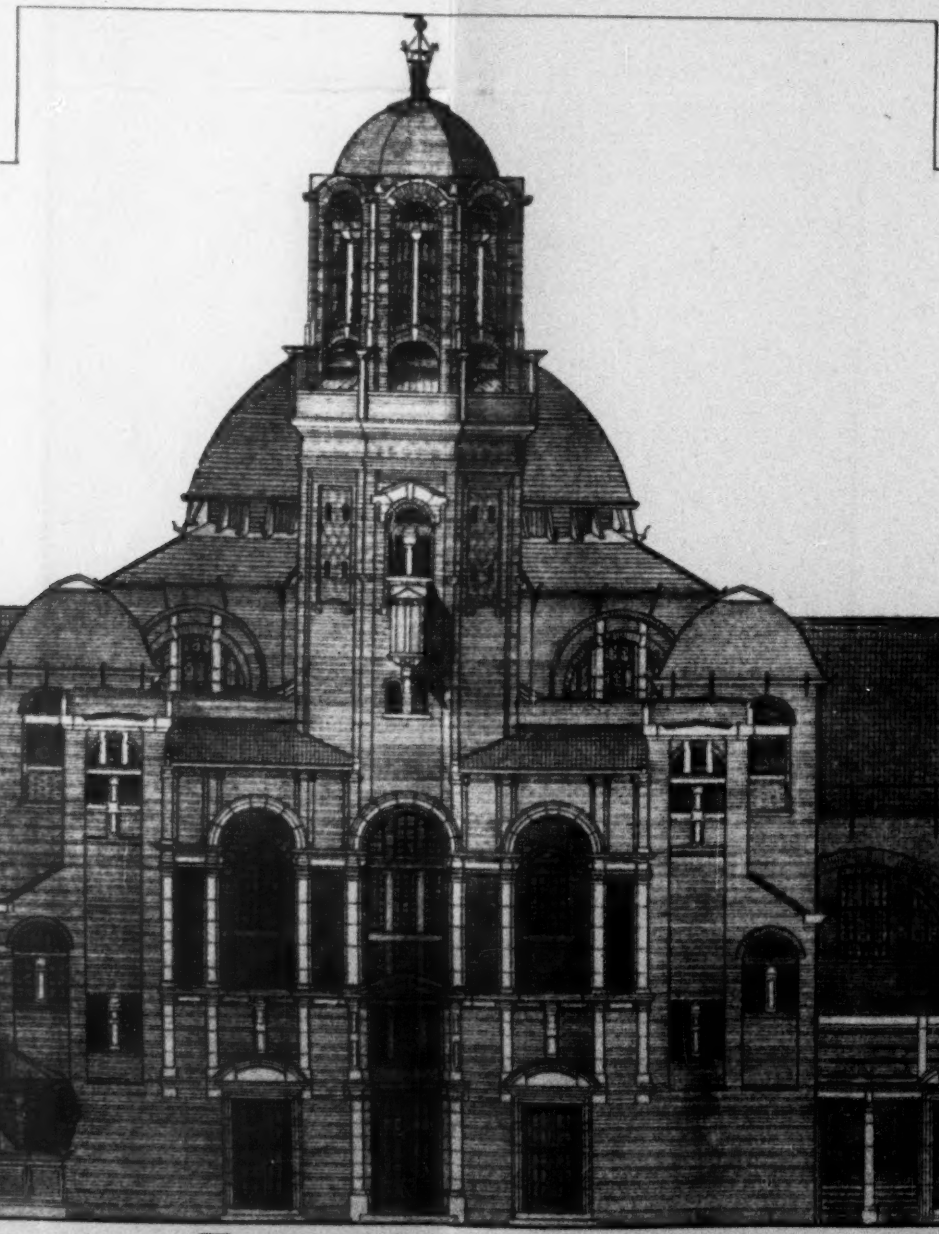
CHRIST CHURCH, NORTH BRIXTON, LONDON.—Professor Beresford Pite, F.R.I.B.A., Architect.











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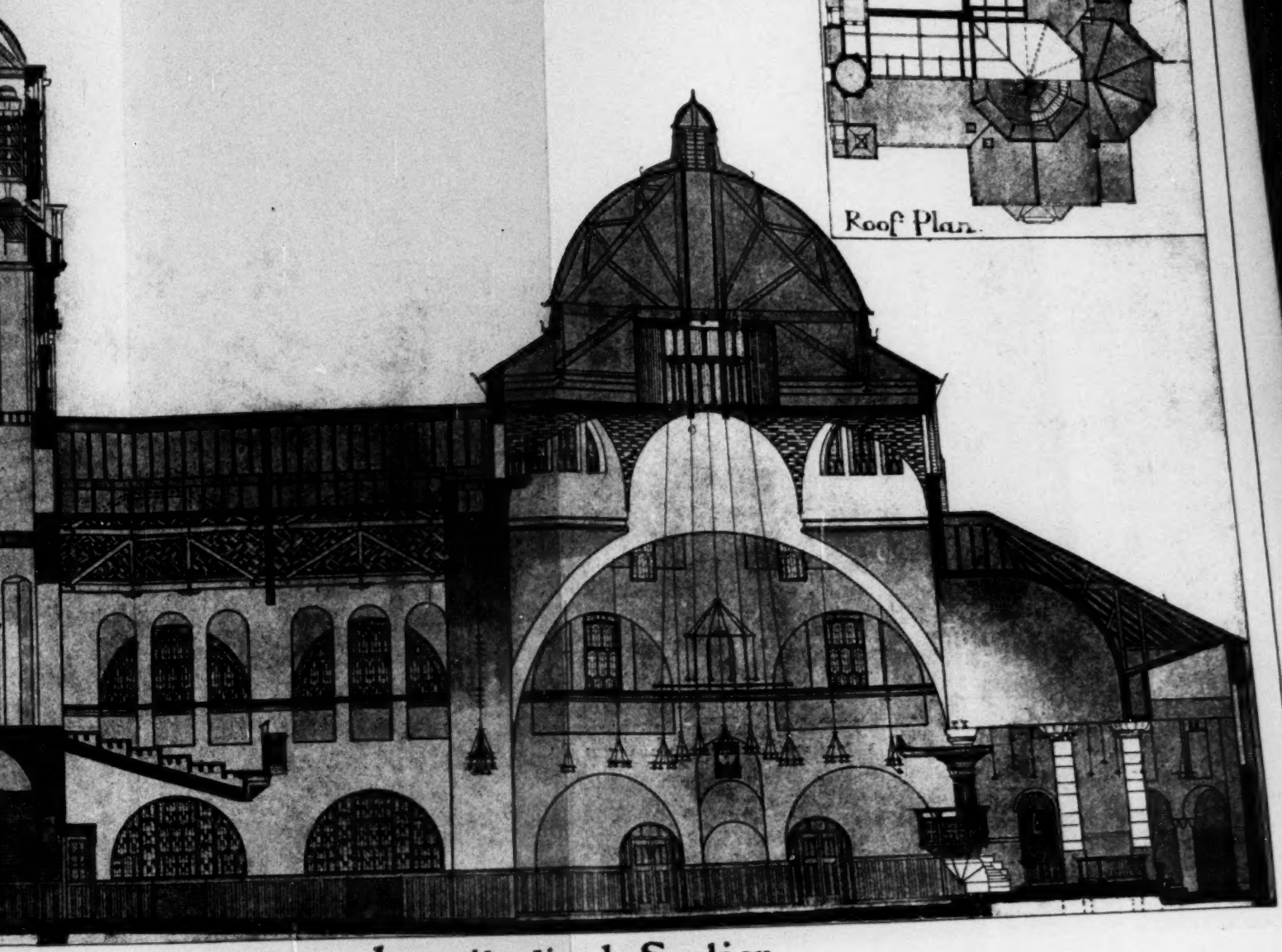
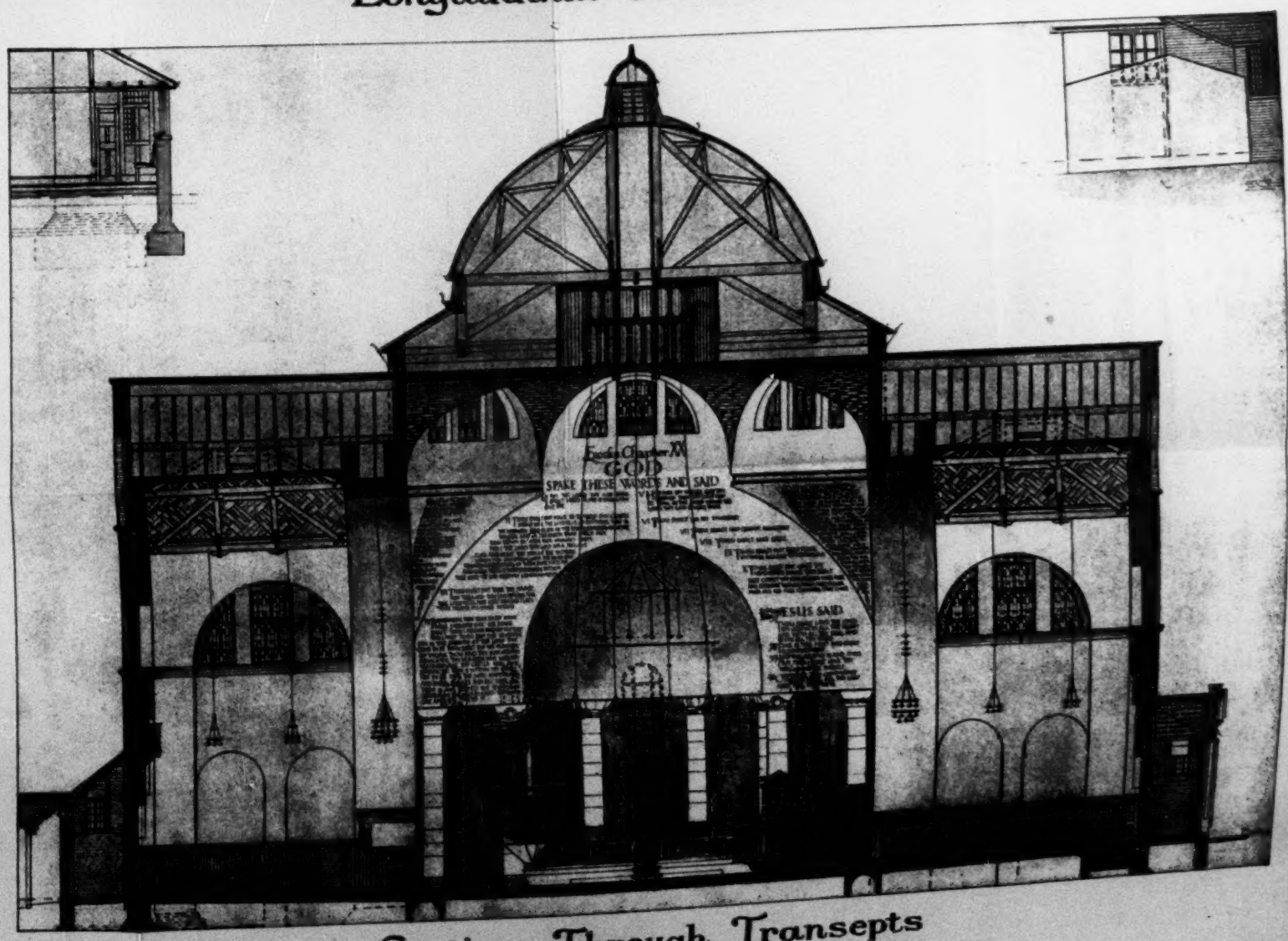
CHRIST CHURCH, NORTH BRIXTON, LONDON.—Professor Beresford Pite, F.R.I.B.A., Architect.



Longitudinal Section



Section Through Transepts

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NEW GUILDHALL OFFICES AT THE BAR-GATE, SOUTHA

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BAR-GATE, SOUTHAMPTON.—Mr. R. M. Lucas, Architect.

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THE WESTERN THEOLOGICAL COLLEGE, BRISTOL.—Mr. H. Dare Bryan, F.R.I.B.A., Architect.

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PHOTO LITHO. SPRAGUE & Co LTD 4 & 5, EAST HARDING STREET, FETTER LANE, E.C.

THE PRINCIPAL'S HOUSE, WESTERN THEOLOGICAL COLLEGE, BRISTOL.—Mr. H. Dare Bryan, F.R.I.B.A., Architect.

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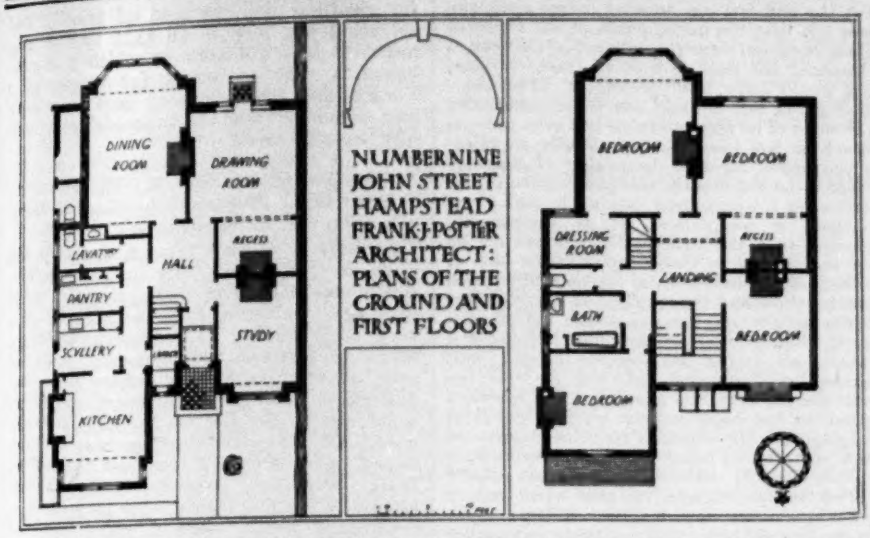


HOUSE, JOHN-STREET, HAMPSTEAD.

THIS house takes the place of an old, badly-built stucco house, and, as most of the existing houses in this road are finished in this material, it was decided to use roughcast for the exterior of the new house. The plinth and chimney stacks are in red brick, and the roof is tiled. The leading considerations borne in mind in planning the house were that the aspect to the road was northerly and that no lights were possible on the west side. The house was originally intended to be used as a private residence, but is now used as a private school. Mr. Wm. Tout, of Hendon, was the builder, and Mr. Frank J. Potter the architect.

CHURCH, SHARROW-LANE, SHEFFIELD.—A new church is being erected in Sharrow-lane by the Methodist New Connexion. The building will be of brick, with stone facings. Accommodation is to be provided for about 500 persons, at a total cost of 3,250*l*. Mr. J. C. Brameld is the architect, and Messrs. W. & A. Forsdike are the contractors.

THE HOUSING QUESTION IN GERMANY.

IN his voluminous report on the trade and commerce of Germany for the year 1904, Mr. Consul-General Francis Oppenheimer, the British representative at Frankfort-on-Main, devotes considerable space to the important question of small lodgings and housing accommodation generally. He observes, *inter alia*, that the housing question, one of the many social problems of the present day, may be said to have originated with changes dating back to the seventies, when on the one hand industry began to preponderate over agriculture and on the other hand the small industrial concerns of old developed into modern firms on a larger scale. The result of both these changes was a tremendous increase in the population of the towns (more especially of the towns with more than 100,000 inhabitants); like gigantic suction machines they depopulated the country. Considerable numbers of people were suddenly and permanently massed together in a comparatively limited space, and in consequence rents increased in spite of the limited means of the majority. While everywhere else an increased demand produces an increased supply, the very existence of the housing question proves that the demand for small lodgings and for cheap lodgings has by no means been satisfied. Thus during April, 1905, there were in Frankfort 133 single-room lodgings available for 554 applications, so that not even one-fourth of the demand could be satisfied. The disproportion between demand and supply of apartments with two rooms was even greater; only one-sixth of the demand could be met. In the case of three-room apartments, half the number of applicants only found what they sought. The supply of apartments of four rooms and above, however, was plentiful.

The annual increase in the population of Germany numbers 800,000; these, as well as those already in existence, must be housed properly, and most of them must be housed cheaply. The rapid increase of the population, and the facilities of modern traffic, have caused a rise of rents generally, so that the poorer classes of the population are spending a constantly increasing percentage of their income in the payment of rent. If the increase in the rents that has taken place during recent years were to continue without check, the calculation of what would be the price in 1925 for even so limited an accommodation as an apartment consisting of two rooms would yield alarming figures. The Imperial Minister of the Interior has frankly admitted that he regarded the housing question as one of the most important problems, possibly the most important, to be solved by the German social policy of to-day; for the benefit of the tremendous machinery put into motion to combat such evils as the various contagious and other diseases, the abuse of alcohol and immorality, must remain problematical if a clean and healthy home, the starting point of all social life, cannot be provided. Space is limited, and, as far as it is required for cheap housing, difficult to replace once opportunities have been missed. What were suitable sites only a few years ago have in many German towns been bought up by speculative builders, who have produced luxurious apartments along luxurious streets. Besides this increase in the value of sites, the prices of building materials have been more expensive, wages have risen, and lighter ways of building have been ousted by heavier, and certain luxuries have become part and parcel of modern apartments of which they have again increased the price.

The Imperial Treasury has since 1901 spent 15,000,000 marks for the purpose of providing housing accommodation, but these sums were practically limited to cheap apartments supplied for Imperial officials with small salaries. The Home Office has in some instances encouraged the building of small apartments by letting sites

House, John-street, Hampstead. Mr. Frank J. Potter, Architect.

on prolonged leases (Erbbaurecht) at reduced rental, under the condition that artisans' dwellings be erected. Yet in only too many instances as, *e.g.*, in the case of Schönholzer Haide, in the north of Berlin, has the Treasury disposed of Treasury lands to builders and others at the best possible price, though suitable for cheap lodgings, and has thus missed rare opportunities. The *lex adickes*, with its limited application to Frankfort, was prompted by similar considerations. Many of the large factories have spent great sums in supplying their workmen with lodgings, often model dwellings; in some instances the area covered by such workmen's houses practically equals that of large villages, namely, in the case of the chemical works near Höchst and others. The disadvantage of this system, however, lies in the fact that the tenancy ends with the contract of labour, and the workmen are thus easily robbed of the possibility of an independent attitude in questions arising between employer and employé. In some parts of Germany building societies of a charitable nature were started with a purpose of building cheap dwellings for the workmen. Thus in Rhenish-Prussia there exist 117 such building societies. The number of houses supplied by the societies amounted, up to April, 1904, to 4,242, containing 9,020 lodgings; 62·5 per cent. were built for sale, the others for letting; both kinds were chiefly built on the plan of admitting two families. The rents are on an average 20 per cent. cheaper than the ordinary local rents; in the houses for sale the workmen live more cheaply, too, after deduction of the payments made to capital account. Yet the financial position of the building societies is in most cases entirely satisfactory—seventy-one of them paid the average dividend of 3·2 per cent. If the 9,000 families thus housed are on the average calculated to consist of five persons, 45,000 to 46,000 persons in Rhenish-Prussia approximately owe to these building societies healthy and clean homes, from which there is small danger of ejectment and where there is no fear of increased rents. Insurance companies and savings banks have from time to time invested money in similar building enterprises, yet the initiative of this charitable work is purely a question of chance.

All these attempted remedies, however, have at best bestowed local benefit only. The evil as such had not been attacked on a broader basis until a Bill was put on the table of the present Diet, which for the first time attempted to provide a uniform remedy for the whole kingdom. As the want of small lodgings remains dependent upon the speculative activity of the professional builder, the Bill in one of its parts devises means to remove the causes which have so far deterred the builder from erecting small lodgings. The unwholesome speculation in sites, which is the chief reason of the present high rents, is rendered impossible by provisions concerning the planning of the streets, the building plans, the frontage line, etc. Whereas the present building plans generally favour deep sites, very wide streets, and consequently buildings with an endless number of apartments and courtyards (resulting in a considerable rise in the value of the sites), the new building plans are to be devised on a footing corresponding to the requirements of the districts, so that quarters that are suitable for small lodgings shall be mapped out in shallow sites and streets of lesser width. As an inducement for the building of small lodgings, the contributions towards the road making are to be considerably reduced in all cases in which healthy and appropriate lodgings are contemplated for the housing of families of small means. This concession is extended to building and other societies if by their by-laws their shareholders are limited to a maximum dividend of 14 per cent., and which societies, when wound up, distribute only the nominal share value and make over the possible surplus to charitable and similar institutions. The benefit of this provision is also extended to workmen and people in a similar position if the buildings to be erected by them are intended for their sole occupation or the occupation of themselves together with, at the utmost, two families in similar circumstances.

The second part of the Bill regulates the police intervention in the case of bad and crowded apartments. It is thereby enacted that for communities of 10,000 inhabitants and more the police shall be compelled to frame lodging by-laws; that they may frame such by-laws for communities with less than 10,000 inhabitants. These by-laws must regulate the questions concerning sufficient air space, the separation of the sexes, the sleeping accommodation of employés and servants, etc. Provisions are also made for the inspection of lodgings by special officials, the communities with more than 100,000 inhabitants being forced to appoint a lodging board consisting of competent persons to carry out such inspection. Thus the Bill tackles the housing questions from three different points: (1) By means of the building plans and building regulations; (2) by means of reduced taxation; (3) by the introduction and supervision of minimum demands concerning hygiene and morality.

Yet the Bill has not escaped severe criticism. It was felt that the introduction of the Prussian Bill has rendered very precarious the chances of an Imperial Bill dealing with the same subject, which would have been preferable. The innovations in the Bill are said not to go sufficiently far, as some of its regulations do not even provide as much as has been at times locally supplied. The provisions for the cheapening of lodgings are said to be insufficient, as the reduction in the contribution towards road making is said to be too small a temptation. It is furthermore demanded that the lodging by-laws should be made compulsory in those communities also of less than 10,000 inhabitants, for there is no real connexion between the quality of the lodgings and the number of the population. The agricultural labourer, who certainly has the benefit of light and air during the summer months, will, as a rule, derive no benefit from this law when the winter months keep him indoors. The question of windows has been entirely ignored, yet light in lodgings is as important as air; the importance of this question of light may be gathered from the fact that in 1900 Berlin counted 24,000 so-called "cellar lodgings," so that 5 per cent. of its inhabitants were then lodged in cellars.

In the Grand Duchy of Hesse there exists since 1902 a law whereby any community can be compelled to participate financially, together with the Hessian Treasury, in the construction of cheap lodgings. It is claimed that financially this law has in no way resulted in losses to the communities; in many cases, on the contrary, their poor law expenditure has been reduced. As, moreover, the town of Mayence has already started its own official Housing Board, the Grand Duchy of Hesse at present takes the lead in any official attempts towards the solution of the housing problem.

The general interest taken in the housing question may be gleaned also from the fact that during the month of October the first General German Housing Congress was held in Frankfort, and was attended by approximately 1,000 members from all parts of Germany, among them representatives from various Government offices. This congress was the first national congress of its kind, for although the housing question has been touched upon on other occasions, only one other meeting has been held which had limited its debates to this subject, namely, the International Congress, which had met at Düsseldorf two years before. The Frankfort Congress, however, discussed the question purely from a German point of view, hence its importance, for among all the social-political questions, the housing question has probably the least chance of being solved internationally. The Prussian Bill was on that occasion subjected to a very minute criticism, and many improvements introduced into the Bill during the committee stage will, to a great extent, be due to the deliberations of the Congress.

Books.

Stanford's New Map of the County of London, on the Scale of 4 in. to one mile. (London: E. Stanford. 1905.)

THIS is a new edition of Mr. Stanford's 4-in. scale map of the County of London, which first appeared eleven years ago, and to which much information has been added since. It is comprised in twenty sheets enclosed in a neat portfolio, and with an index map on a smaller scale. We may take from the prospectus the following statement of matter included in the map:—"The map extends to Barking and Cross Ness on the east, and includes the whole of the extra-metropolitan Borough of West Ham; on the west it embraces part of the Borough of Ealing, the whole of the Borough of Richmond, and the greater part of the Borough of Kingston; on the north part of the Borough of Hornsey; and on the south the Borough of Wimbledon and the Hamlet of Penge, with the northern verge of Croydon. The schools of the London County Council Education Committee, the hospitals of the Metropolitan Asylums Board, the Fire Brigade stations, and the large open spaces now under the control of the London County Council, are accurately engraved. The railways and railway stations, above and below ground, the docks, steamboat piers, public markets, museums, churches and chapels, hospitals and institutes, theatres, music-halls, and other public places, are duly shown. Altitudes in feet are given at frequent intervals all over the map, enabling the resident to determine the height of his residence above the level of the sea, or, by deducting 12 ft. 6 in. from the engraved figures, the height above the level of the Thames." We may add that for clearness and precision of printing and colouring the map is all that such a map ought to be. The form in which it is published is very convenient for keeping in a library, and the index map does away with any difficulty from the unavoidable division into separate sheets.

Picturesque Essex. By R. H. E. HILL, A.R.I.B.A. Illustrated by Duncan Moul. London: F. E. Robinson & Co. 1905.

THIS book is in most respects similar to the work on "Middlesex," by the same author, which was noticed in these columns a short time ago. It serves to draw attention to a very large number of interesting buildings, both ecclesiastical and domestic, scattered over a considerable area where stone was difficult to obtain or non-existent, and where wood, brick, and flint are the chief materials used. Of the larger examples may be mentioned Layer Marney Towers and Faulkbourne Hall, both fine examples of brickwork, especially the first-named, with its terra-cotta ornamental detail; while in every town and village in the county are numberless houses of less pretentious exterior but charming in grouping and proportion. The Moothall, at Thaxted, is a building of the type of those found at Ledbury, Hereford, and Leominster. Although not resembling either in actual design, charmingly grouped houses are to be met with in Saffron Walden and Castle Hedingham, and the churches are also rich in timber detail of a very interesting kind. The letterpress is very largely given up to a description of the various buildings, and useful information is given about their history as well as their architectural details.

The illustrations, on the whole, are good, but many suffer from over-elaboration and a certain scratchiness in the draughtsmanship which is not altogether pleasing. Among the best are three small illustrations of the old gate at Barking and the churches at Stock and at Greenstead. There is also a picturesque drawing of that well-known object, the ruined church, at Chingford. The book will doubtless draw attention to a very interesting county, not so well known as it might be.

A Manual of the Law of Flats. By G. ST. LEGER DANIELS, Barrister. London: *Estates Gazette*, Ltd. 1905.

THE "Law of Flats" is technically not a very correct term; since it consists, in fact, chiefly of parts of the law of landlord and tenant and part of the law of easements, and of other substantial parts of English law. Thus the question whether the landlord of a ground floor is liable to his tenant, the former also being landlord of the upper part of the building, for damage caused by a leaky cistern, depends on general principle. The case in question, though applicable to flats, arose out of the tenancy of a warehouse, and it was held that unless there was negligence on the part of the landlord he was not liable. Still, this being a handy little volume, it will have abundant practical uses for those who have to do with flats.

BOOK RECEIVED.

SMOKE ABATEMENT. By W. Nicholson. (Chas. Griffin & Co. 6s.)

TRADE CATALOGUES.

WE have received from the General Electric Company, of Queen Victoria-street, the 12th edition of their catalogue of "Wires and Cables." The list of cables is very complete, and the specifications, tests, and guarantees given are quite satisfactory. Useful wire tables are quoted, and the data given will be of the greatest use to electricians. We have also received the section of their catalogue describing the single and polyphase induction motors which they have for sale. We have noticed that all the parts of their machines are interchangeable, and so a new part can be sent at any moment to replace any one which has been damaged or become worn. The machines are wound either for single-phase or polyphase circuits, and for a frequency of 50. The illustrations and diagrams are all excellent. They also send a paper model of a battery wall telephone which they list at 16s., and a leaflet describing new and very cheap types of electric hand-lamps. The

low price at which telephones and self-contained hand-lamps are now sold will make them popular.

The Columbian Fireproofing Company send us their catalogue of armoured cement pipes, made in accordance with the "Bonna" system. For many years pipes of similar construction have been largely used on the Continent, and especially in France, for the conveyance of water and sewage, and, after an investigation extending over some three years, the Columbian Fireproofing Company have purchased the rights of the "Bonna" system for Great Britain. It is claimed for pipes of this description that the first cost is very much less than for cast-iron or mild steel pipes, and that the cost of upkeep is practically nothing, owing to the absence of corrosion and leakage. In the case of pipes intended to resist pressure, an inner tube of steel is first built up of sheet steel, this tube preventing the penetration of moisture as well as serving the purpose of reinforcement. A collar welded to each end of the tube forms the flange of the completed pipe, and assists the process of jointing. Spiral coils of +-bars are then wound around the steel tube both internally and externally, and connected by longitudinal bars of the same section. The armoured skeleton is placed in a vertical position, and after suitable moulds have been applied, cement-mortar, mixed to the consistency of grout, is poured in. A great convenience is that the pipes can be manufactured on the site of the works to be executed, the mixing plant being moved from point to point as work progresses. The catalogue contains views illustrating the construction and laying of these pipes, which can be made to any required size or shape, and fitted with junctions, tees, and bends as may be necessary.

Messrs. R. Waygood & Co. send an illustrated prospectus describing their lifts for private residences. A point emphasised in this little book is the convenience of the automatic push-bottom system, as applied to electric and hydraulic passenger lifts. Reference is also made to the adaptation of automatic control to electric service lifts, and to a special type of dinner lift designed to reduce noise to a minimum. This prospectus is of little use to architects, being evidently intended for private purchasers.

Correspondence.

"DECAY AND PRESERVATION OF STONEWORK."

SIR,—In reply to Mr. Sturge Cotterell's letter in your issue of July 8, *re* a statement I made with regard to "Box Ground" stone, that "this quarry appears to be nearly if not quite exhausted," I have, through the courtesy of the Bath Stone Firms, visited the Bath stone quarries, and find my statement to be incorrect.

This particular quarry of "Box Ground" stone (now called "St. Aldhelm's Box Ground") is fully at work and turning out immense quantities of splendid stone as heretofore, and the supply seems inexhaustible. W. R. PURCHASE.

COST OF WIDENING ROAD.

SIR,—The case mentioned by "Enquirer" (see page 235 *ante*) is one of great interest to landowners, and is a question that is constantly cropping up where land is being developed for building.

I have had to deal with several similar cases, and find that the usual custom is for the freeholders to give the necessary land for widening, and for the District Council to bear the cost of widening and making good the road.

The arrangement, of course, varies according to the value of the land and the cost of the road widening; and it seems to me impossible for any test case to hold good in a matter of this sort, as the conditions necessarily vary in each instance. DOUGLAS WOOD, A.R.I.B.A.

CALCAREOUS CEMENTS.

SIR,—In thanking you for the complimentary review of our work with the above title, will you kindly allow me to point out that all the recent types of rotary kilns used in this country are avowedly based on American models, and for this reason we selected examples from the United States. We have not failed to point out that, while the invention belongs to our own countrymen, the earlier kilns proved without exception to be failures, and had to be abandoned.

May I also state that though the name of my colleague, Mr. Charles Spackman, is the same as that of the eminent American cement expert in Philadelphia, these gentlemen are in no way related to one another, and have no business connexion of any kind. The choice of Messrs. Lathbury & Spackman's kiln was chiefly influenced by their excellent book on this subject.

GILBERT R. REDGRAVE.

The Student's Column.

STEAM BOILERS AND PIPES.—X.

BOILER SETTING (*concluded*).

WATERTUBE boilers furnish the subject for the concluding instalment of our notes upon boiler setting.

Steam generators of this family exhibit great variety of design, and we cannot possibly deal with more than one or two typical forms.

Perhaps the most familiar type of watertube boiler is that comprising front and back headers, connected by straight tubes placed in an inclined position, and surmounted by either one or two steam and water drums. One of the best-known generators complying with this brief outline is the Babcock & Wilcox boiler, but as others are very similar in appearance, the following remarks may be taken as being generally applicable.

Fig. 46 illustrates the ordinary method of setting a watertube boiler with two drums. The concrete foundation, as usual, should extend over the site upon which the boiler is to be erected. The side walls are of 18-in. brickwork, including a fire-brick lining, well keyed in from bottom to top. The front wall largely consists of the various doors and framing, with brickwork of suitable thickness, generally 18 in. thick up to the upper header, and 9 in. thick above. The back wall is 18 in. thick. By reference to Fig. 46 it will be seen that stanchions are built into the front and back walls for the purpose of supporting the cross-girders from which the steam and water drums are suspended. The fire-bridge wall is 2 ft. 3 in. thick at the bottom, and the two other division walls, one at the top and the other at the bottom, are 9 in. thick. The outlet leading to the main flue may be as drawn in Fig. 46, or can be carried underground if more convenient.

As the positions of the openings in the furnace front supplied with the boiler and the positions of the various mechanical details govern the arrangement and construction of the brickwork to a very large extent, it might be thought that the design of the furnace and combustion chamber involves very little consideration on the part of the architect. This is not quite the case, as we shall now show.

In the first place, the construction of brick corbelling between the side walls and the steam and water drums, as shown in Fig. 46, is not the best practice. Next, the employment of ordinary fire-bricks in the top courses of the bridge and the upper division wall has the disadvantage of covering unnecessarily large areas of the tubes and drums, and the lower division wall, when built as in Fig. 46, is by no means desirable or convenient. Finally, the furnace section of the customary type, as represented in Fig. 46, is about as bad as can be, for complete combustion cannot be expected in a furnace where the gases proceed vertically from the grate and immediately pass among the water-cooled tubes above.

All these details are capable of improvement, and the architect who makes use of watertube boilers of the general class now under consideration should make a point of insisting upon such modifications as are likely to facilitate inspection and to keep down the coal bill.

Fig. 47 illustrates an improved method of setting a watertube boiler. In the cross-section it will be observed that fire-clay arch blocks, which can easily be lifted out for purposes of inspection, take the place of brick corbelling.

In the longitudinal section it will be seen that bricks of semi-circular form are used for reducing the bearing surface of the drums on the front, back, and upper division walls, and of the tubes on the top of the bridge. The lower division wall is set further away from the mud drum, and the space is covered by fire-clay arch blocks, thus leaving reasonable space for examination and the handling of tools for disconnecting pipes and fittings.

An important improvement in the furnace for a watertube boiler is illustrated in Fig. 48, which represents the arrangement adopted at the Kensington and Notting Hill Electric Light Works. This form of furnace has two arches of refractory material serving to deflect the hot gases and lead them in the right direction. Being provided with an auxiliary air supply by way of the bridge, all the conditions necessary for perfect and smokeless combustion are secured.

A furnace designed in this manner permits the use of bituminous coal without the production of black smoke, and is in every way worthy of adoption.

We ought to mention here that Messrs. Babcock & Wilcox have already introduced a somewhat similar furnace in connexion with their watertube boilers (see Fig. 49). In this, described as the Scotch furnace, and specially intended for bituminous coals, the products of combustion pass under a fire-brick roof formed over the front portion of the lowest row of tubes to a secondary combustion chamber, into which slightly heated air can be admitted, the supply being regulated by the stoker.

Among other forms of watertube boiler we select the Stirling type for the purpose of illustrating a rational system of furnace construction.

Fig. 50 is a cross-section of this boiler, in the setting of which provision is made for insuring the contact of the heated gases with the several clusters of tubes in regular succession.

A still better arrangement is shown in Fig. 51, where cross and longitudinal sections are given of another pattern of the Stirling boiler. The furnace here shown is divided into two compartments, each being arched over to deflect the flame so that it comes into contact with the lower portion of the tubes, being guided upwards by a fire-block partition, over which it passes and enters a second combustion chamber, where a fire-block baffle directs the gases to the second series of tubes. In like manner the gases are directed to and in the third chamber, whence they pass through the fourth group of tubes to the main flue. The various fire-clay blocks shown in these drawings are of the Poulton type, and the wall and floor linings are formed with serrated bricks of the kind illustrated in Fig. 32 *ante*. The employment of means for reducing the radiation of heat from watertube boilers of all kinds is particularly desirable as the walls of the setting are subject to much higher temperatures than Cornish, Lancashire, and other internally-fired boilers.

An illustration of the manner in which heat is absorbed and stored in the brickwork of watertube boilers is given by Mr. Strohmeyer in a report to the Manchester Steam Users' Association.

In this case a watertube boiler had been in operation at full power for several hours. The demand for steam then ceased, and firing was stopped suddenly, but the supply of feed water had to be maintained for five hours more because the boiler continued to blow off steam all this time. The reason was that, while raising steam, and during the first few hours of working, an enormous quantity of heat was absorbed by the brickwork; then, when the demand for steam suddenly ceased, the reserve heat reappeared, with the results stated. Had the steam demand been limited and steady this feature of the boiler would have been less noticeable. It would have been necessary to force the fires to their utmost extent during the first four hours, not only for steam production, but also for heating the brickwork. A time would have come later when the firing would have had to be reduced to its normal condition, and at the end of the day the heat of the fire would have been supplemented by that previously stored in the brickwork, and no serious inconvenience would have taken place after working hours.

Under the conditions actually prevailing, however, the heat stored in the brickwork caused waste of fuel as well as inconvenience.

General Note on Flues Around Boilers.—In the foregoing articles we have given approximate dimensions for the flues of the most commonly-used types of steam boilers. If such flues could be designed in strict conformity with theoretical requirements to provide for a predetermined uniform velocity of

the gases on the basis of a given coal consumption per hour, the results would not be satisfactory. The area of each flue would then be proportioned to suit the assumed volume of the gases in each part of the system. But as the temperature of the flame in a boiler furnace is at about 2,500 deg. F., and the temperature of the gases ranges from, say, 1,700 deg. at the fire-bridge to some 650 deg. at the dampers, the flues would have to be tapered in accordance with the diminishing volume of the gases. This would be impracticable, and, further, the furnace tube and some of the flues would be undesirably large, or some other flues so small as to prohibit access for cleaning purposes. Again, the presence of soot and flue dust, and the variable space occupied in the flues by soot deposits, would upset any calculations made with mathematical precision.

Fig. 52, reproduced from Mr. Bryan Donkin's work on "The Heat Efficiency of Steam Boilers," gives some idea of the disorganisation likely to be caused by foreign substances in boiler flues, and is sufficient to show that the velocity of the gases would be very different in the case of clean and foul flues.

Of course, in actual practice, no specified velocity can be maintained, owing to fluctuations in the steam demand involving variations in fuel consumption, and consequently in the volume of gases to be conveyed. Still, although we have seen that relative uniformity of velocity is not practicable in the different flues of a boiler, it is desirable to approach as nearly as possible to uniformity as may be possible. Above all, it is important to avoid sharp bends and narrow necks causing excessive friction, and sudden enlargements causing eddies in the current of gases.

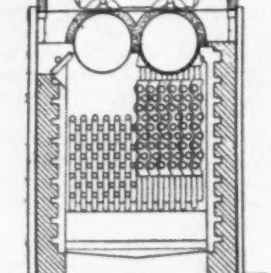
All sharp projecting corners should be rounded off, all entering angles filled, and an easy sweep given to all surfaces which are intended to change the direction of the draught. Further, the interior surfaces of all brickwork should be as smooth as possible with the object of reducing friction.

For the purpose of facilitating the process of proportioning the flues for any boiler we give, in Table XIV., the volume of the products of combustion at different temperatures for various weights of air supply per pound of coal.

This table has been calculated by the formula :—

$$q = Q \times \frac{461 + t}{461 + T} \cdot \cdot \cdot \cdot \cdot (1)$$

where Q = volume of gases at the temperature T = 32 deg. F., = 1·000, q = volume of air at the temperature t; and 461 = degrees from



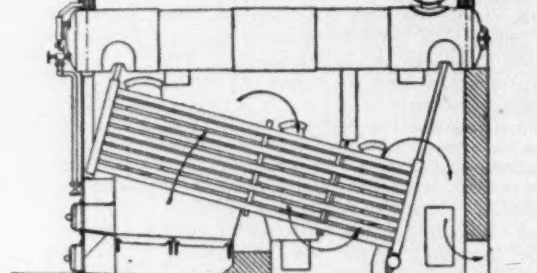


FIG. 46

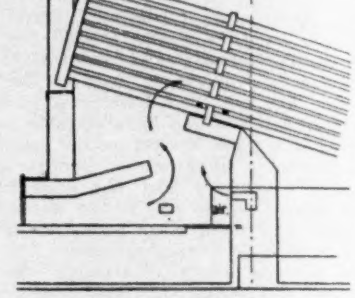
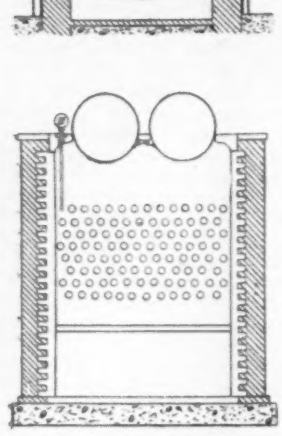


FIG. 48



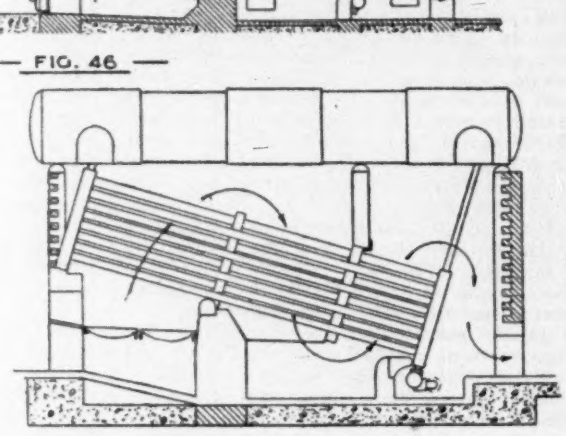


FIG. 47

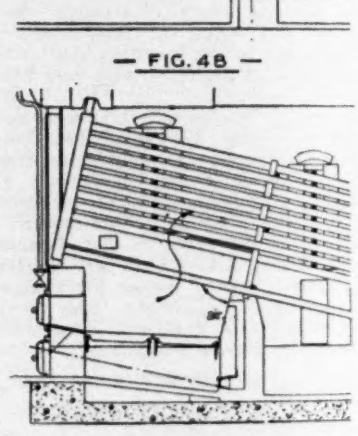


FIG. 49

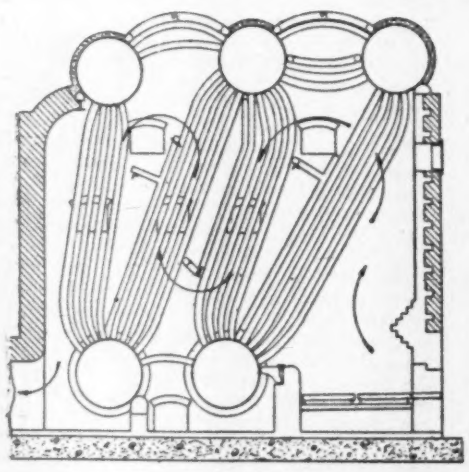


FIG. 50

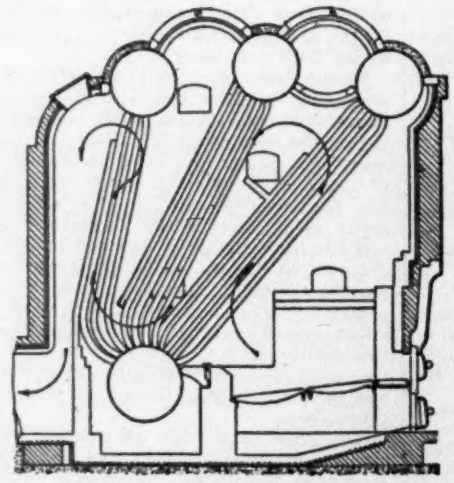


FIG. 51

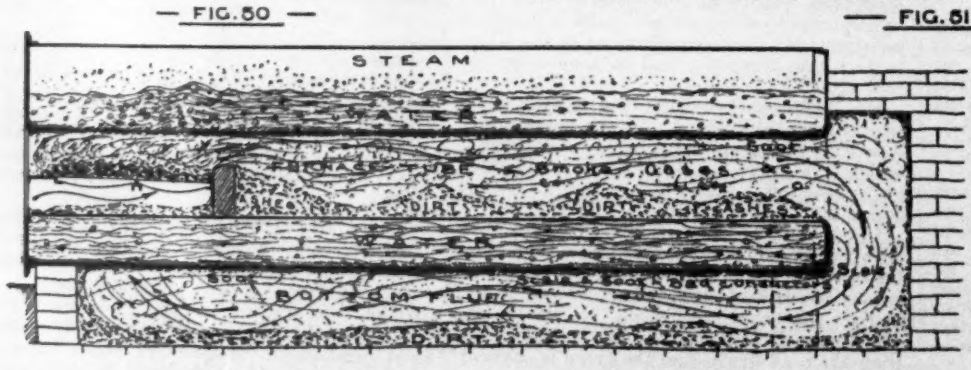


FIG. 52

Illustrations to Student's Column.

TABLE XIV.—VOLUME OF PRODUCTS OF COMBUSTION FOR VARIOUS WEIGHTS OF AIR SUPPLY PER POUND OF FUEL.

Temp.	14 lb.	16 lb.	18 lb.	20 lb.	22 lb.	24 lb.	26 lb.	28 lb.	30 lb.
deg. F.	cu. ft.	cu. ft.	cu. ft.	cu. ft.	cu. ft.	cu. ft.	cu. ft.	cu. ft.	cu. ft.
32	173·4	198·3	223·0	247·9	272·6	297·4	322·2	346·9	371·7
62	184·1	210·3	236·7	263·1	289·2	315·5	341·8	368·1	394·4
100	197·4	225·6	253·9	282·4	310·2	338·5	366·7	395·0	423·1
200	232·6	265·9	299·0	332·5	365·6	398·7	432·0	465·2	498·4
300	267·8	306·1	344·3	382·5	420·8	459·1	497·4	535·7	573·8
400	303·0	346·2	389·5	432·8	476·1	519·4	562·7	606·0	649·2
500	338·2	386·5	434·8	483·1	531·4	579·7	628·1	676·4	724·6
600	373·6	426·7	480·0	533·3	586·6	640·0	693·4	746·7	800·0
700	408·6	467·0	525·4	583·7	642·1	700·4	759·0	817·4	875·6
800	443·7	507·1	570·6	633·9	697·2	760·7	824·1	887·6	950·8
900	478·8	547·3	615·8	684·1	752·5	821·0	889·4	957·9	1,026
1,000	514·1	587·6	661·2	734·5	807·9	881·4	955·0	1,028	1,102
1,100	549·3	627·7	706·3	784·7	863·2	941·7	1,021	1,098	1,177
1,200	584·5	673·6	751·6	835·1	918·5	1,002	1,086	1,169	1,252
1,300	619·5	708·1	796·8	885·1	973·6	1,062	1,151	1,240	1,327
1,400	654·8	748·4	842·0	935·4	1,029	1,123	1,216	1,310	1,403
1,500	690·1	788·6	887·4	985·8	1,084	1,183	1,281	1,380	1,479
1,600	725·2	828·8	932·6	1,036	1,140	1,244	1,347	1,451	1,554
1,700	760·5	869·2	977·9	1,086	1,195	1,304	1,413	1,522	1,629
1,800	795·6	909·3	1,023	1,137	1,250	1,364	1,478	1,592	1,705
1,900	830·8	949·5	1,069	1,187	1,306	1,424	1,543	1,662	1,780
2,000	866·0	989·7	1,114	1,237	1,361	1,485	1,608	1,732	1,856
2500	1,042	1,191	1,340	1,488	1,637	1,786	1,935	2,084	2,234

absolute zero to 32 deg. F. As a matter of fact, the gases contain carbon dioxide, nitrogen, unconsumed oxygen, water vapour, and other substances, but no appreciable error is caused by taking the volume of the mixture at that of an equal volume of air at the same temperatures.

Assuming the motive force of the chimney to be sufficient to cause the passage of a certain weight of gases per hour, it is clear that the relative velocities of the gases in the furnace tube and flues of the boiler must depend upon the respective areas and shapes of these parts, and the character of their interior surfaces.

The diameter of the furnace tube must not exceed a certain proportion to the diameter of the boiler shell, and in practice its area is already fixed by the boiler maker. Similarly, the width of the side flues is settled beforehand, this dimension being governed by the necessity for providing ample space for access. Hence, as a general rule, the collective area of the side flues is about 50 per cent greater than the area of the furnace tube, and the excess is more marked in the smaller-sized boilers. For this reason, uniform velocity is out of the question, and the chief thing in settling the sizes of the flues is to see that the dimensions are such as to secure progressive decrease of the velocity from the one end of the system to the other.

By taking suitable values for the mean temperatures, which should be in accordance with the extent of the exposed heating surfaces, it should be easy to arrive at correct proportions for the various flues of any boiler.

OBITUARY.

MR. JAMES K. COLLING.—We have to record the death of Mr. J. K. Colling, one of the founders of the Architectural Association, who passed away, after a brief illness, on September 1, at the advanced age of eighty-nine. With the exception of hearing, which was somewhat impaired, he retained all his faculties and pursued his lifelong hobby of drawing in water-colours till within a few weeks of his death. His published works on Gothic Art and Mediæval Foliage continue to occupy a prominent position among the interesting records of the Gothic revival; while his love of flowers and foliage and his persistent habit of drawing from nature everything which interested him led to the production of "Art Foliage" in 1865, and a second edition in 1878. The beautiful original drawings, from which the plates for these books were produced, were presented to the library of the Royal Institute of British Architects in February, 1902; and in the Royal Institute of British Architects *Journal* No. 8, of Vol. IX., third series, a brief account of Mr. Colling's career is given, with a list of some of the buildings erected from his designs. Among the most important of these were a large block of offices in Liverpool, decorated with some fine ornament founded on floral forms, and the church on Mr. Naylor's estate at Hooton, Cheshire.

MR. MAYLARD.—The death on August 26, at Southsea, is announced of Mr. Charles Grason Maylard, of No. 34, King-street, Cheapside, and Claygate, Surrey, architect and surveyor, in his seventieth year. Mr. Maylard was elected an Associate of the Royal Institute of British Architects in 1874. He was architect of St. Mark's Church, Wimbledon, completed in 1888, and of some houses with shops in Queen's-road, Bayswater.

GENERAL BUILDING NEWS.

CATHOLIC CHURCH, BARMOUTH.—The new Catholic church at Barmouth, dedicated to the memory of St. Tudwall, is divided into a nave to accommodate 200 people, with gallery at the end and a chancel and the usual sacristies. The upper part of the tower will be used for a belfry and the lower part for an organ. There will be a total accommodation for 250 people. The design of the edifice was adapted to suit local material, the treatment being of early English Gothic, and the material used has been Minffordd stone with Cefn stone dressings. The roof is open-timbered, and the flooring consists of wood blocks. The tower is finished in an apex with a statue of the Blessed Virgin, a carved canopy and niche. Mr. A. Gilbertson, Liverpool, was the architect, and Mr. Shanley, Liverpool, the clerk of works. The principal part of the contract was carried out by Messrs. Lloyd, Williams, & Jones, and the sub-contractors were Messrs. Evans & William carpenters; Messrs. Minshull & Co., plumbing; Mr. John Morgan, plastering; and Mr. John Roberts, painting. The total cost is estimated at about 5,000*l.*

MISSION CHURCH, DINNINGTON COLLIERY.—The foundation-stone of the new mission church at Dinnington Colliery was laid on the 4th inst. The new building will seat 200 persons, and the estimated cost is about 850*l.* The architect is Mr. C. S. Errington.

MISSION CHURCH, MERRINGTON-LANE, NEAR SPENNYMOOR.—The foundation-stone of a new mission church at Merrington-lane has just been laid. The church, which will be known as Ven. Bede's, provides sitting accommodation for 200 persons, and the site is in a central situation, between Merrington-lane and Low Spennymoor. The structure will be of pressed brick, built with stone dressings. The building will consist of nave and sanctuary, and provision is also made for a clergy vestry, and also for a bell gable, to be surmounted by a stone cross. The contractor is Mr. H. C. Howe, of West Hartlepool, and the work is being executed from designs by Mr. Stephen Wilkinson, architect, of Newcastle-on-Tyne.

MISSION CHURCH AT NORTH SHIELDS.—The Lord Bishop of Newcastle (Dr. Lloyd) dedicated recently St. Faith's new church, in Hudson-street, North Shields. The new church was designed by Mr. W. Hope, architect, and the contractor was Mr. Joseph Pelton, of North Shields.

CHURCH, HOVE.—The new Bible Christian Methodist Church, which for the past twelve months has been in course of erection at the corner of Old Shoreham-road and Montefiore-road, Hove, is now practically completed. Externally the walls are faced with rubble flint-work with dressings of Bath stone and buff-coloured bricks, and the roofs are covered with Broseley tiles. The main entrance is in Montefiore-road, where there are three doorways, a large central one, flanked by two smaller ones but there is another entrance in Old Shoreham-road with an oak porch, which also forms the main entrance to the lecture hall and classrooms immediately adjoining the church on the western side. The site measures 160 ft. by 68 ft., and the total cost of the whole building, including the site, is nearly 7,000*l.* The church is seated for 412 persons, including a choir of forty-two, all the seats being on the ground floor. Provision has been made for the ready addition of a gallery at the east end to accommodate about ninety more. At present the site of the staircases for the gallery is utilised for ante-rooms. The church comprises a nave, two shallow transepts, a chancel, and an organ chamber. The seats are of pitch pine, varnished, and the pulpit, which is at the south-west end, is of American wainscot oak. The chancel contains the communion table, which stands behind a low panelled pitch-pine screen, the frieze of which is decorated with carved panels representing corn and grapes. In the rear of the communion table are the seats for the minister and elders, behind which are the seats for the choir, the whole being arranged in semi-circular form. Behind these, on the wall of the chancel, there is a wooden screen with panels, surmounted with a carved canopy, enriched with cherubs' heads. Above the screen is a stained glass three-light window, the centre panel of which contains an emblematic figure of Faith, while the side lights are treated with conventional representations of the date palm. The walls are plastered with floated stucco of a warm buff tint, at the foot being a wooden dado. The church and lecture hall have open timber roofs of pitch pine slightly stained and left unvarnished. The heating is by low pressure hot-water system. There is a ventilating turret at the crossing of the roof containing an exhaust ventilator, into which the vitiated air is sucked by an electric fan. The windows are glazed with tinted glass in lead quarries. The floor of the church slopes upwards to the extent of about 18 in. from the pulpit to the back of the church. The lecture hall, which seats some 250 people, is approached by a short staircase, it being above the ground level. Underneath the hall, on the ground floor, there is an infants' class-room, and seven other class-rooms, three of which are divided off by roller shutters and can be converted into one large room. A second staircase provides an emergency exit from the hall and also an approach to the minister's vestry, a kitchen, and a ladies' cloak-room. The staircases are composed of teak, and all external doors open outwards. The building is lighted throughout by electricity, the electroliers being of wrought iron. The organ is by Messrs. Morgan & Smith, and cost between 300*l.* and 400*l.* The architect is Mr. Edwin J. Hamilton, of Brighton, and the builders, Messrs. Hockley & Co., of Grantham and Brighton.

BOYS' SCHOOL, TONYREFAIL.—A new school for boys was recently opened at Tonyrefail. The work has been carried out from plans prepared by Mr. Jacob Rees, architect, by Messrs. Lewis & Davies, builders, Tonyrefail.

SCHOOLS, WOMBWELL.—New non-provided schools were opened at Wombwell, near Barnsley, on the 31st ult. The new premises occupy two acres of ground, and provide accommodation for 660 children, 420 in the mixed department and 240 in the infants. The cost of the work is 10,087*l.* 1s. Mr. John Robinson, architect, prepared the designs.

MONASTERY, LODDISWELL.—On the 30th ult. part of the monastery built at Wood Barton, near Loddiswell, by the Cistercian Trappist monks, was opened. Erected from the plans of Canon Scoles, the building is dedicated to Our Lady of Compassion. When fully completed the monastery will be of quadrangular shape. At present only one side is finished. It is of three stories, built of local stone, with granite main coigns and sills, and white brick window dressings. In the basement are cellars, warehouses, laundry, drying apparatus, sculleries, kitchen, bakehouses, etc. The living-rooms and dormitories are on the ground floor. The next floor will be used by the Chapter, and the space above will provide additional dormitory accommodation if required, and storage for grain. A part of the ground floor is now used as a chapel, but when the other wings are built the present building will be the public part, for the guests, and will include a library. In another wing will be accommodation for the lay brethren of the novitiate; a church, 200 ft. long, will form another side of the square, and will include seven chapels. There will also be an infirmary wing. The cost of the present building was 8,500*l.*, the expense of laying out the ground alone being over 200*l.* When finished the monastery will accommodate 200 persons. The present building provides lodging for about 60.

HYDRO, PEEBLES.—It has been decided to rebuild Peebles Hydro much on the lines of the building which was recently destroyed by fire. The east wing, which was built a few years ago, containing thirty-three bedrooms, and the large smoking-room with its panelled oak dado and ceiling, together with the gentlemen's lavatory and the whole of the kitchen stores and larders, has only been partially damaged, and some of the floors are intact. Its original cost was about 12,000*l.* The new billiard-room for three tables, recently erected, is also intact. The recreation-room, which was in course of being constructed when the fire took place, is not entirely destroyed. The walls are standing, and the new steel roof which had just been fitted up has not been injured, and the material for its completion is partly on the ground and partly in the workshops where it was being made. Practically the whole of the back wall of the main building is intact, and so also is the gable and return wall of the east wing, so that a large part of the old building can be utilised. The new plans embrace additions at the back of the building. It contains forty-four bedrooms, with lavatories, and a large boiler and engine house, etc., in the basement. Altogether the new building as planned will contain, in addition to the principal rooms, 180 single and double visitors' bedrooms and sitting-rooms, as compared with 165 rooms in the old

building. A feature in the original plan was the grand corridor, 13 ft. wide and 210 ft. long, which extended the whole length of the building and continued for over another 100 ft. as a conservatory, terminating with an octagonal dome 32 ft. in diameter, forming a promenade over 300 ft. long. This conservatory, constructed of steel and iron, is intact, excepting a small portion adjoining the main building. This feature is still being preserved in the new design, but the lighting of the corridor will be improved by the introduction of ornamental glazed screens in the side walls. These screens will be so arranged that they can be thrown open and the rooms adjoining converted into a grand lounge, forming with the corridor a great open space for promenading, and where tea, coffee, etc., can be served. This lounge can also be used as dining space, being connected to the main dining-room. The dining accommodation thus available will be sufficient to dine over 300 people at one time. A feature in the new plans will be a covered balcony or verandah, 8 ft. wide, extending along the whole of the main front. The windows of the rooms which adjoin the balcony—namely, drawing-room, writing-room, grand lounge, and dining-room—will extend down to the floor level, and open out in the form of French casements on to the balcony. The main dining-room will be in the same position as the old room, but the service-room and stillroom in the new plan will be more conveniently situated. The new recreation-room will be 100 ft. by 37 ft., having an elliptical roof with a glazed ceiling of lattice design extending the whole length of the apartment. The one end of the room will be fitted with a proscenium and stage. This room will be sufficient to seat 400 people with the greatest comfort. On the first and second floors suites of rooms have been so arranged as to form sitting-room, bedroom, and dressing-room en suite. The swimming bath, which is below the recreation-room, has not been injured in any way. The Turkish and Russian baths have been rearranged in the new plan. They are so arranged that they can be entered from either the ladies' or gentlemen's side. A new swimming bath will be provided for ladies, in addition to a complete suite of slipper baths for each sex. The outer walls of the building will be built of stone and faced with rough cast. The roofs will be covered with bright red tiles, while all outside woodwork will be painted white. The entire floors and partitions of the building will be fireproof throughout. The buildings will be lighted throughout with electricity. The total cost of the structure will be 37,000*l*. The architect for the new hydro is Mr. James Miller, Glasgow. The building contractors are Messrs. Anderson, contractors, Glasgow.

BATHS, CHORLTON-ON-MEDLOCK.—The new Victoria Baths are situated in High-street, Chorlton-on-Medlock, on ground which was formerly occupied by the Victoria Park Tennis Club. The building is in the Renaissance style, and was planned by the City architect (Mr. Henry Price). The elevations are in Ruabon brick and Bath terra-cotta. There are three swimming baths, two for men and one for women. The first-class bath for men has been designed to meet the requirements of swimming galas. The water area is 75 ft. by 40 ft., and the depth is from 3 ft. to 6 ft. There is a gallery at one end of the bath fitted with seats for 350 people. The woodwork of the dressing boxes is dispensed with as far as possible, the divisions being constructed of bricks 2½ in. thick and glazed on both sides, and there are cast-iron columns in front. The handrails and spittoons along the sides of the baths are made of bronze. First-class wash baths are ranged on the ground floor, and second-class wash baths on the balconies around the second-class swimming bath. Wash baths for women are on the balconies around the swimming bath set apart for females. Each swimming bath has walls of concrete lined with asphalt and enamelled glazed brick facing. The floors and gangways are finished in terazzo. A set of Turkish and Russian baths is also provided. A feature of the baths is the accommodation provided for the storage of bicycles.

HOSPITAL, FALMOUTH.—Admiral Sir Lewis A. Beaumont, K.C.B., K.C.M.G., Commander-in-Chief at Devonport, laid the foundation-stone, on the 23rd ult., of the new hospital in connexion with the Royal Cornwall Sailors' Home. Connected with the Sailors' Home by a covered way, the new building will stand on a portion of the garden at the rear of Bank House, which directly adjoins the present institution. The exterior of the building will be of brick, with rough cast. On the south-east side will be a verandah and a room for convalescents. The main ward, which will be 25 ft. by 24 ft., will be provided with six beds, while there will be two smaller wards to accommodate two beds and one respectively. Accommodation will be provided for nurses, an operating theatre, bath-room, and the usual offices. The operating theatre will be as far removed from the wards as possible, and it will be equipped with a specially made lantern, 8 ft. by 5 ft., for lighting the apartment. The floor of the wards will be of wood, and the remaining portions of the building will be laid with tiles. The main entrance will lead into a hall, and near the side of the building there will be a garden for the use of convalescent sailors. The building will be heated by a service of hot-water pipes. The architect was Mr. W. Kennard Jenkins, and the contractors Messrs. G. Miners & Son, of Marazion. The building will cost about 2,500*l*.

CEMENT WORKS, CAMBRIDGE.—The Saxon Portland Cement Company have erected a new factory at Cambridge at a cost of 80,000*l*., which will be called the Norman Works. The works are equipped on the rotary kiln system, and will turn out 1,250 tons per week. The factory was designed by Mr. W. Gilbert, engineer, Victoria-street, Westminster, S.W.

HOSPITAL EXTENSION, GRIMSBY.—On the 25th ult. the extension to the Grimsby and District Hospital was opened. The new buildings consist of a waiting-hall for out-patients with casualty dressing-room, surgeons' consulting-room, and male and female retiring rooms on either side. The hall has an entrance from Yarborough-street, adjacent to which are male and female lavatories for patients. A new dispensary forms a part of the enlargement, and this gives exit for the patients to the front of the buildings. A surgeons' consulting-room, with lavatories attached, is also provided on the ground floor. On the first floor, over the out-patients' hall, nine bedrooms have been constructed for the nursing staff, each being quite separate and distinct. A bathroom and lavatories are situated on this floor. The out-patients' hall and corridors are laid with marble terrazzo floors, the walls having a high glazed brick dado and being finished with Portland and Parian cement above. The buildings throughout, new and old, have been heated and supplied with a hot-water service. The enlargement scheme and the various improvements have been carried out from plans prepared by, and under the superintendence of, Mr. Herbert C. Scaping, architect. Messrs. Gilbert & Kirton were the general contractors, Mr. J. Hogg has been responsible for the joinery work, and the sub-contractors were:—Masonry, Mr. Green; slating, Mr. Capes; plumbing and ironwork, Messrs. J. Duke, Limited; painting, Mr. Speechley. The heating and hot-water scheme was entrusted to Mr. Tabor, heating engineer, Cambridge.

NEW POST OFFICE, LIVERPOOL.—A new post office is being erected at the junction of Walton-road and Morley-street, Liverpool. The building will consist of a basement and ground floor, with the exception of the centre block, which will have an additional first and attic floor. The basement floor, which will practically extend under the whole of the building, will consist of a basket store, communicating by lift with the sorting office above, postal stores, heating chamber, and retiring-room for postmen. On the ground floor will be the sorting office, 96 ft. long and 45 ft. wide, adjacent to which, with the entrance facing Walton-road, will be the public office for the despatch of postal and other public business. Adjoining the public office will be the telegraph instrument-room, the remainder of the floor being occupied by the telegraph messengers, inspectors, and cycles. The mail yard is situated at the rear of the sorting office, while accommodation will also be provided for the various trucks and conveyances used in the postal service. The first floor of the central block will comprise the inspectors' writing-room, female retiring-room, etc., and a store-room, while from the staff staircase access will be gained to the watching gallery. The main façade of the building will be treated in Renaissance style, and is being carried out in red pressed brick and stone. The building has been designed by and is under the supervision of Mr. Pott, of His Majesty's Office of Works, London.

CLUB PREMISES, WILLENHALL.—New premises are to be erected by the Willenhall Liberal Club, from plans prepared by Mr. Robert Law. The work will be carried out by Messrs. Hickin & Sons.

COUNCIL OFFICES, HESTON AND ISLEWORTH.—The new offices for the Heston and Isleworth District Council in Treaty-avenue will shortly be completed. The main approach is in the centre, under a portico carried on red faience terra-cotta pillars, and the balcony overhead is designed for use as the spot whence the results of elections can be announced, whilst above this is a gallery. On each of the balcony are terra-cotta figures. A basement, railed off, extends along the front and partially along the two ends. The offices can be reached either from the main entrance or from separate doors at the sides of the building. On the ground floor there are the clerk's department, consisting of private office, clerk's office, second clerk's office, waiting-room, room for files, papers, etc., and a strong room. The surveyor's department, likewise on the ground floor, comprises private office, clerks' office, waiting-room, drawing office, small recess and desk for chief assistant, and plan room. The sanitary department will consist of medical officer of health's private room, inspector's private office, and inspector's clerk. For the education department there are to be two rooms, for the electric lighting department two rooms, and for the rate-collectors two rooms. There are also four spare rooms provided. On this floor is a room for the hall porter and the telephone, and the staff lavatories. The main entrance is in the centre of the building, with a spacious hall, with the surveyor's and sanitary department on the right, and the clerk's and education on the left, with entrances from the corridor. At the rear is provided the electric light and rate-collectors' departments. There is to be a separate entrance for the clerk's and education departments, and also a separate entrance for the surveyor's and sanitary departments. As the clerk will also act on the Education Committee, accommodation is provided on the opposite side of the corridor, so that he will be in close proximity. The sanitary and surveyor's departments are also together. In the basement is a general strong room, heating chamber, coal and coke store, surveyor's and sanitary inspector's stores, and general kitchen, also a caretaker's living room, kitchen, larder, etc. The basement is approached by two separate staircases. From the hall a staircase, carried upon faience terra-cotta columns, approach is to be had to the Council chamber and committee rooms. The Council chamber will be 58 ft. by 44 ft. A chairman's retiring room is provided, also a councillors' retiring room. There are three committee rooms, each 19 ft. by 18 ft., and a spare committee room 16 ft. by 18 ft. The waiting room is 10 ft. 3 in. by 18 ft. The entrance to the public gallery in the Council chamber is by a separate staircase. A serving space is provided with lift from the basement. The upper portion of the building consists of four caretakers' rooms and clerk's and surveyor's stores, and all are approached by separate staircases. The lighting throughout will be electric. The architect is Mr. Nowell Parr, of Brentford.

LIBRARY, PENARTH.—The new Penarth Free Library was formally opened on the 30th ult. The entrance is by a doorway into a vestibule, with two pairs of swing doors opening into the hall, from which access is obtained to the lending library and librarian's room. The lending library has an area of about 850 sq. ft., and has been fitted with stacks for books capable of containing about 10,000 volumes, but further fittings can be placed in as required to give accommodation for another 10,000 volumes. From the hall on the other side there is a reading-room for men 44 ft. long by an average width of 24 ft. and a height of 25 ft. On the first floor, approached from the hall by a stone staircase, there is a room 31 ft. by 19 ft., intended for a reference library; also a room 34 ft. long, with an average width of 17 ft., intended for use as a ladies' reading-room, with lavatory accommodation in connexion therewith. There is also accommodation in the basement of the building for a boys' reading-room 30 ft. by 18 ft. The building is fitted up with a heating apparatus on the low-pressure system. The design of the structure is Elizabethan in style, having a tower at the corner of Stanwell and Rectory roads, in which has been placed a clock, with provision for illuminating the dials, and ding-dong chimes. The building is faced with blue Pennant stone, obtained from the Craig-yr-hesg Quarries, near Pontypridd. The cost of the building has been about 4,200*l*., exclusive of the site, which was given by Lord Windsor, 4,000*l*. having been contributed by Mr. Andrew Carnegie. The building has been designed by Mr. H. Snell, architect, Penarth, the contractor being Mr. F. Bond, builder, Cardiff. The heating apparatus was supplied and fitted by Messrs. John Williams & Sons, of Cardiff. The building has been fitted throughout for electric lighting.

EXTENSION OF MUNICIPAL OFFICES, TAUNTON.—The extension of the Taunton Municipal Offices, consisting of the addition of a new wing, has now been completed. The new structure contains a suite of offices and committee-rooms, including town clerk's rooms, offices for the waterworks' manager, collector of rates, medical officer, surveyor, and sanitary inspector, together with a committee-room and caretaker's apartments. The contractor was Mr. T. H. Moggridge, and the work was carried out under the supervision of, and from plans prepared by, the late Borough Surveyor, Mr. J. H. Smith.

FREE LIBRARY, TAUNTON.—The new Taunton Free Library occupies a site immediately opposite the Municipal buildings, and the School of Art is being erected on the ground adjoining. The building, which is of red Williton stone, with Ham Hill dressings, has a frontage of 60 ft. to Corporation-street, with a return elevation of 70 ft. on the west side of three bold bay windows. It is of Tudor-Gothic style, with an entrance in the centre, which leads directly into the hall and vestibule. The lending library is 35 ft. long, 22 ft. wide, and 18 ft. high. It is fitted with steel bookshelves, and contains a counter for the convenience of borrowers, upon which the indicator is placed. On the opposite side is a newspaper and magazine room, 48 ft. long and 22 ft. in width. The whole of the ground floor is supervised from the librarian's office, which is at the back of the public space. The first floor is approached by a staircase leading to the reference library, which is 25 ft. long and 17 ft. wide. Adjoining this is the stockroom for reference

books. The whole of the building is heated by the low pressure system, and is lighted throughout by electricity, and an electric fan is placed in each room for ventilation. Messrs. A. Colbourne Little and Ingleson C. Goodison were the architects, and T. H. Moggridge the builder for the work.

QUEEN VICTORIA MEMORIAL HALL, LAMPETER.—The opening of the Queen Victoria Memorial Hall at Lampeter took place a short time ago. The hall will contain about 800 people, and has been built from designs by Mr. Bankes Price, architect.

CLUB PREMISES, HULL.—The new premises of the St. Andrew's Club Company, Ltd., at Hull, have just been opened. The work was carried out from plans prepared by Mr. Gaskill, architect, by Mr. M. Harper, builder.

LECTURE-ROOM, ETC., EBENEZER CHAPEL, ABERTILLERY.—The new lecture-room and classrooms of Ebenezer Baptist Chapel, Abertillery, have just been opened. The building consists of a large hall with a gallery on three sides, with the floor under divided into four classrooms, two being for infants, and capable of seating about 150 each. Owing to the limit of ground, there was no room to build classrooms outside the hall itself, and so the architect has arranged a series of movable partitions, by which the large hall and galleries are divided into seventeen smaller compartments and classrooms, some of them large enough to accommodate twenty scholars, so, in all, accommodation is provided for something like twenty-five classes. The buildings are constructed of local stone, with Forest stone dressing. The contractor was Mr. Moses Adams, Abertillery, who carried out the work under the supervision of the architect, Mr. W. Beddoe Rees, Cardiff.

HOSPITAL, NEWBURN.—The new hospital for infectious diseases, erected at Newburn by the Gosforth, Newburn, and Castle Ward Joint Hospital Committee, was opened on the 5th inst. The new buildings were designed by Mr. Thomas Gregory, of Newburn, and the contract has been carried out by Messrs. Davison & Bolam, of Blaydon (now E. R. Davison), the contract price having been 7,964*l*. The site covers two acres, on the sunny side of Knop Law Hill, overlooking the river Tyne. The buildings are of brick, with stone dressings. The administrative block is two stories high, the rest being one story. There are also an observation block, in two similar halves, each containing a two-bed ward for males and a two-bed ward for females, with nurses' duty-room, and bathroom between; a typhoid fever pavilion, with six-bed wards for males and females; a scarlet fever pavilion, similar to the typhoid fever pavilion, and a laundry block.

CLUB PREMISES, BRIMINGTON, DERBYSHIRE.—The new premises of the Brimington Club were opened recently by Mr. C. P. Markham, J.P. The building consists of five principal rooms as follows:—Billiard-room, smokeroom, card-room, reading-room, and committee-room. There is also a bar, and the usual conveniences. The entrance hall is lined with white glazed bricks, with a pitch pine dado, and a wood block flooring. The premises, which are at the junction of High-street and John-street, have a frontage to the former thoroughfare of 76 ft. The architect is Mr. Sydney Allen, of Chesterfield, and the builders are Messrs. James Fox & Son, of Brimington to whom the contract was let for 1,000*l*.

BOWLING PAVILION, FORRES, N.B.—The Forres Bowling Club have just opened the extended pavilion. The pavilion has been lengthened by 6 ft. and the front filled in with glass. The plans were prepared by Mr. W. K. Cutlar, and the contract carried out by Mr. William Black.

SANITARY AND ENGINEERING NEWS.

TYNEMOUTH'S WATER SUPPLY.—After many years the problem of providing the borough of Tynemouth with an adequate water supply has reached a stage when solution is within easy view. Instead of adopting the very expensive plan of securing Parliamentary powers to buy out the Newcastle and Gateshead Water Company's rights in the district and acquire the monopoly the Corporation, in October, 1901, made a start with a scheme which is to cost in the end nearly half a million of money. A huge embankment is being built across the valley of the river Font, among the Rothbury Hills, and a reservoir will thus be formed a mile and an eighth in length, covering an area of 87 acres. Draining a watershed of 7,400 acres, over which the average rainfall for the last seven years has been 36 in., the reservoir will eventually hold 720,000,000 gallons of water. The average daily flow of the Font is 7,666,000 gallons, and the quantity required to meet the daily consumption in Tynemouth is 3,725,000 gallons, so that there will be a large surplus from which to supply neighbouring authorities who may desire to participate in the benefits of the scheme. There are five filter beds already constructed, and three more have to be made adjoining the reservoir. After being purified the water is carried to the borough, 24½ miles away, by a gravitation main 18 in. in diameter. The engineers are Messrs. James Mansergh & Son, Mr. Francis R. Hull being the resident engineer.—*Manchester Guardian.*

WATER SUPPLY, LOSSIEMOUTH.—The new water supply at Lossiemouth introduced from Blackhills has been completed and opened. The engineers for the scheme were Messrs. Gordon, of Inverness.

EDINBURGH WATER SUPPLY.—The new Talla waterworks for the increased supply of water to Edinburgh are now practically complete, and will be opened towards the end of this month. The works were begun ten years ago, and include an embankment across the Talla water, 1,200 ft. long and 90 ft. above the river bed, also a conduit leading to Edinburgh 35 miles in length, nine miles of which consist of tunnel and twelve miles of cut and cover aqueduct. The works will yield an average daily supply of 10,000,000 gallons, and the cost, which was originally estimated at three-quarters of a million pounds, will prove on completion to be over a million and a quarter. Owing to the death of the first contractor, the Edinburgh Corporation transferred the scheme to Mr. John Best, Edinburgh. Mr. W. A. Tait, of Messrs. J. & A. Leslie & Reid, is the engineer in consultation with Mr. G. H. Hill, M.Inst.C.E.

STAINED GLASS AND DECORATION

BISHOP JENNER MEMORIAL.—Stained glass has been inserted in a two-light window in the south aisle of the parish church, Preston-next-Wingham, Kent, as a memorial of the late Dr. Jenner, Bishop of Dunedin, New Zealand, formerly vicar. The figures are of St. Gregory and St. Augustine of Hippo, with small groups depicting events in their lives. The window, designed by the late prelate's son, Mr. Henry Jenner, has been executed under his superintendence by Mr. T. F. Curtis, of Messrs. Ward & Hughes, Soho.

MEMORIAL WINDOW, GLENCRAIG, CRAIGAVAD.—The unveiling and dedication of a stained glass memorial window which has been placed in the east chancel of Glencraig Church took place a short time ago. It was designed and made by the "Tiroler Glasmalerei," of Innsbruck, and represents "The Resurrection of our Lord." The centre panel shows the figure of the Saviour with angels at His feet, while the outer panels have replicas of Roman soldiers. Mr. Hartley Patterson was responsible for the designing of the architectural alterations.

APPOINTMENT.

THE new City engineer of Newcastle, Mr. C. R. S. Kirkpatrick, who was appointed on the 6th inst. to the position with thirty-five votes as against thirty-three for Mr. W. J. Steele, of Bristol, is thirty-two years of age. He was educated at Repton, and received the ground work for his subsequent career at the Crystal Palace Engineering School. Mr. Kirkpatrick has had considerable experience of railway engineering, for, after leaving the Crystal Palace School, he in 1891 became pupil to Mr. E. B. Thornhill, chief engineer of the London and North-Western Railway. His progress was rapid, and in 1893 he was assistant engineer on the London and North-Western Railway under Mr. A. W. Willet, M.Inst.C.E., at Wigan. Then in 1895 he was appointed engineer to Mr. J. T. Firbank, M.P., for the widening and deviation of the L. and N.W. Railway and Midland Railway main lines between New Street Station, Birmingham, and Saltley. In 1896 Mr. Kirkpatrick accepted an appointment as engineer to Messrs. John Wilson & Sons on the first section of the new L.N.W. Railway between Leeds and Huddersfield, and later served as engineer to Messrs. Monk & Newell on the third section of the same railway. He received his present appointment as engineer to the Cleveland Bridge and Engineering Co., Ltd., in 1898, when it fell to him to carry out the contract for the enlargement of Shrewsbury Station for the L. and N.W. and G. W. Railways at a cost of 160,000*l*. After this Mr. Kirkpatrick went to Newcastle to assist in the construction of the new high level bridge over the Tyne.—*Newcastle Chronicle.*

FOREIGN.

FRANCE.—The municipality of Saint-Cloud have opened a competition for the construction of a large scholastic establishment.——The jury in the competition for an asylum for aged men at Saint-Dizier have awarded the first premium to M. Leautey, architect, of Paris.——The new Hôtel de Ville at Corbeil is to be opened shortly. The architects are Messrs. Tavernier & Allorge (Paris), whose design was selected in a competition.——A travelling bridge ("pont transbordeur") is to be constructed at Caen to serve the railway line projected between Havre and Pont-Audemer.——A new stone bridge over the Rhone is shortly to be commenced, between Avignon and Villeneuve, at an estimated cost of 2 million francs.——A statue of Mdme. de Sévigné is to be erected on the principal public place in the town of Vitré.——The Société des Artistes Girondins" have organised, for the occasion of their seventh autumn exhibition, an architectural competition, the subject being "A typical labourer's dwelling."——The municipality of Saint-Claude (Jura) have decided on the construction of a theatre and museum, at a cost of 200,000 francs.——A competition has been opened for the contruction of a viaduct from Saint-Vaast to Valenciennes.——The Departmental Council of the Oise has decided on the construction of a Museum and Library at a cost of 450,000 francs.——The Government has founded a district architectural school at Lille.——The erection of a monument to Henner is proposed, at Bœrnviller (Alsace). It is to be executed by M. Voulot, the sculptor.——M. Francis Leray, architect, of Nantes, has been commissioned to carry out, at Redon, a hotel of important architectural character, to be completed in 1907.——The Freethinkers of Paris have had erected in front of the portal of the church of the Sacré Cœur at Montmartre a temporary plaster statue of the Chevalier de la Barre. It is intended to have it ultimately carried out in bronze. M. Armand Bloch is the sculptor.——A Society has been formed in the department of l'Indre to provide for the preservation of the sites and monuments of Gargilesse.——The death is announced at Montgeron (Seine-et-Oise) of M. Esnault-Pelterie, architect of many private houses and business premises in Paris. He was a Chevalier of the Legion of Honour. The death is also announced, at the age of 77, of M. Auguste M. Breton, honorary architect to the City of Paris, and a member of the Société des Architectes Français. He was a pupil of Normand and Laisné, and carried out important works in the service of the Voirie Parisienne.

SOUTH AFRICA.—The new town hall for Kroonstad, Orange River Colony, has been commenced.——The South Africa Mutual Insurance Co.'s building at Cape Town is in progress, from the designs of Mr. Stucker.——At a meeting of the East London Master Builders' Association, Mr. Charles Keam, the president, referred to the forthcoming conference, the object of which, he said, was to raise the standard of the local building trade. It was also proposed to discuss a proposition that joint representation from the architects and builders of East London be made to the municipal authorities, urging that building plans should be approved only when prepared by recognised and duly qualified architects.

EGYPT.—According to a Cairo correspondent, building operations are proceeding in every direction in the Ismailieh, Tewfikieh, Kasr-el-Nil, and other residential quarters of the metropolis, and the leading firms of contractors and builders are, and have been for some time, fully occupied in erecting new buildings in those localities. Among the new large blocks of buildings now approaching completion are those belonging to the Standard Life Assurance Co., the National Hotel, Daira Khassa in the Sharia Boulac, and others.

MISCELLANEOUS.

PROFESSIONAL AND BUSINESS ANNOUNCEMENTS.—Messrs. Ingall & Son, architects, of 3, Temple-row West, Birmingham, have taken into partnership Mr. E. Stanley Mitton, and the title of the firm in future will be "Ingall, Son, & Mitton."

THE CEMENTERIA ITALIANA.—This, as is stated in a consular report, is a limited company recently formed in Leghorn for the manufacture of hydraulic cement of the Portland type, and of such wares as cement flags and cement pipes. The initial capital of the company is 1,000,000 lire. The raw material comes from quarries at Quercianella, some five miles to the south of Leghorn, which the company has secured for at least thirty years. It is the highly satisfactory chemical analyses of the stone made in Italy, Germany, and Denmark which has led to the formation of the company, and its promoters believe that they possess the finest cement stone as yet discovered. The geological conditions of the quarries correspond with those of Boulogne-sur-Mer. The works of the company will be situated in the manufacturing suburb of Torretta, and will communicate with the railway and with the port by canal. They will soon also enjoy the advantage of the new Leghorn-Vada Railway for the transport of the raw material from the quarries to the works.

FRENCH CEMENT TRADE.—Mr. Gurney, British Consul-General at Marseilles, writes:—"The share of France in the manufacture of Portland cement in Europe is small, and amounts to 450,000 tons per annum. Prices have gone down largely in the last fifty years; 60 fr. was the ordinary rate per ton half a century ago; now the price goes below 30 fr. The cost price is 25 fr. per ton, 22 fr. being the cost of manufacture. The figures of the export of French cements generally are going down. In 1902 only 210,000 tons were exported as against 242,000 tons in 1901. The import is small—some 15,000 tons per annum. In the immediate neighbourhood of Marseilles the production is making progress, having increased considerably of late years; in 1903 72,220 tons of hydraulic lime and 164,890 tons of natural and artificial cements were manufactured. The classes of cement produced in this district are (1) Valentine; (2) Portland, made at Roquevaire, Bedoul, Cassis, Aubagne, and Valdonne; and (3) Roquefort, made at Bedoul. Lime comes mostly from Cassis. The import of British cements at

Marseilles is steadily decreasing. On the other hand the imports from Belgium increase. The cheaper qualities of cements from this district are bought in the United Kingdom for re-exportation.

THE NATIONAL PICTURE COLLECTIONS.—Amongst the most recent purchases by the trustees for the National Gallery of British Art, Millbank, are two examples by Alfred Stevens—a chalk drawing of a female figure, and a design in monochrome for a lunette. The National Art Collections Fund have presented to the Galleries in Trafalgar-square a picture, "The Virgin and Child," by Lazzaro Sebastiani, and J. M. Whistler's painting of old Battersea Bridge, entitled "Nocturne in Blue and Silver." The trustees of the National Portrait Gallery have purchased a death-mask of Alfred Stevens taken immediately after his death (1875) by Mr. R. Townroe, and portraits of A. Welby Pugin; David Cox, painted by W. Radclyffe the younger in 1835; Mrs. J. W. Cross ("George Eliot"), a replica in oils by M. d'Albert Durade of a likeness he painted at Geneva in 1849; Captain Cook, painted in 1766, three years before his death; and James Lonsdale's portrait of James Smith, author with his brother, Horace, of "Rejected Addresses." In accordance with the late G. F. Watts's dispositions his executors have presented two unfinished portraits by him—one of the late Cecil Rhodes, the other of himself—and the trustees have received, by bequest, Frank Holl's portrait of Sir John Huddleston, last Baron of the Exchequer, and one, by Lemuel F. Abbott, of Edmund Lodge, who bought out the volumes "Portraits of Illustrious Personages."

MILAN INTERNATIONAL EXHIBITION, 1906.—At a meeting, held on August 25, of the Exhibition Committee, it was announced that the Government will make a grant of 10,000*l.* in aid of the British section of the exhibition. The exhibition, the first after its kind in Italy, is being organised, to celebrate the completion of the Simplon tunnel, under the auspices of the government of that country, whilst those of France, Germany, Austria, the United States, and other countries will be officially represented. Exhibitors should address their inquiries or applications to the secretaries of the committee at the London Chamber of Commerce. Sir Albert Rollit, M.P., is chairman of the International Exhibitions' Committee of the London Chamber.

ROYAL HIBERNIAN ACADEMY AND DUBLIN SCHOOL OF ART.—A committee has been nominated by the Lords of the Treasury to inquire into the work carried on by the Royal Hibernian Academy and the Metropolitan School of Art in Dublin. The members of the committee are:—Lord Windsor (Chairman), the Earl of Westmeath, Mr. Justice Madden, Mr. George Holmes, C.V.O., C.B. (Chairman of the Board of Public Works, Dublin), and Mr. J. P. Boland, M.P.; Mr. H. P. Boland, of the Board of Works, Dublin, is appointed secretary.

STATUE OF THE QUEEN, HONG-KONG.—The Coronation Committee of Hong-Kong have commissioned Mr. George E. Wade to carve a statue of the Queen, in complement of the existing statues there of the King and the Prince of Wales, of which Mr. Wade was the sculptor.

STATUE OF SIR WM. V. HARCOURT.—Mr. Waldo Story, of Rome, is commissioned as sculptor of a statue of the late Sir Wm. Vernon Harcourt, M.P., to be erected in the House of Commons, where it will be, we believe, the first statue executed by an American artist.

THE LATE C. FORSTER HAYWARD.—The late C. Forster Hayward's estate is proved at 17,500*l.* 1s. 9d., the net personalty amounting to 12,575*l.* 16s. 5d. He bequeathed, we understand, 20 guineas to the Architects' Benevolent Society.

REOPENING OF THE WOKING AND BASINGSTOKE CANAL: SURREY AND HAMPSHIRE.—In pursuance of an Order in Chancery made in the suit "Ingram *v.* The Woking, Aldershot, and Basingstoke Canal and Navigation Company" the property, embracing a total land and water area of about 380 acres, was offered for sale at the mart in last October, but was withdrawn after a bid of 20,000*l.* It is stated that the present owner intends to open a regular daily service of motor boats for goods and passengers between Aldershot and Basingstoke. That section—22 miles long—of the canal offers facilities for the proposed quick traffic, being free from locks, though a tunnel, nearly ¼ mile in length, is cut through the chalk of Grewell Hill, whence, as also from the River Loddon, was obtained the principal supply of water for lockage, etc. The canal enters Surrey in crossing the Blackwater River at a point near Ash in that county; thence it bends northwards by Romping Down to Frimley, and so eastwards to Pirbright, Horsell, and its junction with the Wey at Woodham, between Weybridge and Byfleet. The Surrey portion—15 miles long—has twenty-nine locks, with an aggregate fall of 195 ft., between the Blackwater and the Wey. The canal was begun in 1778, in terms of the Act 18 Geo. III., c. 75, by subscribers to a capital of 126,000*l.*, who obtained in 1793 a further Act (33 Geo. III., c. 16) for raising additional capital of 60,000*l.* in view of the heavy cost of the tunnel at Grewell Hill. The canal, opened in 1796 for vessels limited to 13 ft. beam and 72 ft. length, opens out from the Loddon near Basing village, and winding through Hampshire passes by Old Basing, Nateley, Deepford River, Odiham, and Winchfield, and then, skirting Dogmersfield Park, is carried by a long aqueduct across the valley to Crookham and Aldershot, where is the reservoir. That length had a top level 38 ft. wide and was 5½ ft. deep. A branch—six miles long and level—was made across Hook Common, northwards to Turgis Green, near Strathfieldsaye. The Itchen Navigation joins Southampton to Winchester; an extension—18 miles—of the canal to the latter city would place it in communication with the southern port.

INSANITARY PROPERTY IN LIVERPOOL.—The Report for 1904 by the Medical Officer of Health for Liverpool states that during the year further steps had been taken for the condemnation of insanitary houses. The property on this occasion condemned consisted of 372 houses, with a population of 1,325 persons. The Report describes the nature of these houses:—"The houses are arranged in courts, which are so narrow and so shut in that sunlight and adequate ventilation are greatly obstructed, even to the courts themselves, one of the great sources of mischief being the aggregation and crowding together of houses upon the ground without adequate open space about them. . . . Some of these courts are approached by narrow passages, many of them being converted into tunnels by the extension over them of the rooms above. These tunnels and passages, though constantly scavenged, swept, and washed down, become receptacles for filth of every description. As regards the houses themselves, they consist of three rooms, one above the other, and are back to back and side to side with houses similar in construction. This gives rise to the great fundamental fault, that no through ventilation is possible. . . . The atmosphere of the interiors of these dwellings is invariably foul and offensive, the porous parts of the plaster, etc., are saturated with vapour and organic matter from the skin and lungs of the occupants, which is manifested by the staining and discolouration of the plaster. In the majority of cases the water-closet accommodation consists of a trough placed in the court, and the inconvenience of access leads to the retention of excrement of various kinds within the house during inclement weather and at other times. This is especially the case with regard to children, or in times of sickness. All of the property is dilapidated, a good deal of it being from 70 to 100 years old, and figuring upon maps prepared in the early part of last century." One is glad to find that the Liverpool authorities are continuing steadily in their good work of sweeping this class of houses.

STATUARY, TRURO CATHEDRAL.—The Western and the Phillpotts (south transept) porches of Truro Cathedral have been lately enriched by new statuary, designed and executed under the superintendence of Mr. F. L. Pearson, consulting architect to the Dean and Chapter, by Mr. N. Hitch, sculptor, of Kennington.

BULLER MEMORIAL, EXETER.—A bronze equestrian statue of General Sir Redvers Buller was unveiled at Exeter on the 6th inst. by Viscount Ebrington. The monument has been cast by Messrs. Hollinshead & Burton, of Thames Ditton, from a model executed by Mr. Adrian Jones, sculptor.

CAPITAL AND LABOUR.

NOTTINGHAM BUILDING TRADE DISPUTE.—The Nottingham building dispute, which threatened to develop into a strike, has been practically settled. Into the much-disputed authority rule commencing "Each employer shall have power to conduct his business in any way he thinks advantageous," a clause has been drafted prohibiting piecework, and in one or two other ways the rule has been added to in a way which renders it possible for the men to accept it. All the committees have agreed that walking time shall be paid for from a radius 1½ miles from the Exchange Hall up to four miles, and that, in the event of the work being beyond four miles distance, the employers shall pay the whole of the men's out-of-pocket expenses. The employers have entered into arrangements with at least one of the societies—probably with all—to discuss the wage paid to any non-efficient workmen with a view to having the amount reduced.—*Nottinghamshire Guardian.*

GLASGOW JOINERS' DISPUTE.—The strike of the joiners in Glasgow, which has lasted fully four months, was brought to a settlement on the 1st inst., when, at a meeting of parties representing both masters and men, held in the City Chambers, under the chairmanship of Lord Provost Sir John Ure Primrose, a minute containing terms of agreement was duly signed. The dispute began in April last, when the masters intimated their desire to alter the date of signing the by-laws and reduce the rate of wages from 10d. to 9d. per hour—a course of proceeding which, they contended, was necessary because of the depressed condition of trade at that time. It has now been agreed that the rate of wages shall be 9½d. per hour until July next.

THE LONDON BUILDING TRADE.—The acceptance by the Operative Society of Stonemasons of the new working rules, after certain concessions by the employers, brings half the trade unions in the building industry into agreement with the London Master Builders' Association, who had given notice to terminate the existing agreement and had formulated new proposals. It is now believed that there is no danger of a disturbance in the industry such as appeared probable when the movement first commenced. No alteration in the present rate of wages is to be made, and the employers concede the amendment suggested by the operatives that there shall be one hour for dinner, instead of half an hour during the last three weeks of the winter work, and that the hour rule shall apply to work in shops as well as on jobs. They also withdraw their request for optional opening at 6.30 a.m. in winter, and for permission to otherwise vary the hours under "reasonable circumstances." A further important concession limits the night work, at the rate of a penny an hour addition to the ordinary rate, to nine hours a shift. The London district is altered to mean within twelve miles of Charing Cross instead of ten as formerly.—*Morning Advertiser.*

BUILDING TRADE DISPUTES, TYNESIDE.—The dispute in the building trade of Tyneside and district continues to be settled by sections, and on the 5th inst. the matters over which the employers and labourers had been at variance were amicably adjusted, thus disposing of three of the four trades that went out on strike at the beginning of May. The masons, bricklayers, and labourers having now settled, only the plasterers remain. The conference between the labourers' delegates and the employers, at the Employers' Association offices in Pilgrim-street, Newcastle, was really a continuation of that held last week, when the prospects of a settlement were considered to be very hopeful. The conference lasted for two and three-quarter hours, at the end of which it was intimated that the labourers had agreed to accept 6½d. per hour, or a reduction of a farthing. The original demand of the employers was that wages should be reduced from 6½d. to 6d. A compromise has, therefore, as in the case of the bricklayers and masons, been effected, and half of the proposed reduction accepted. In addition to this, certain amendments have been made in the rules, and the labourers have accepted the conciliation clause adopted by the other two trades that had already settled. In other words, they accept the principle of arbitration. The agreement come to affects both the Tyneside and Blyth districts.—As a result of a conference between the representatives of the bricklayers on strike at Sunderland and the employers it is expected that the dispute will be settled amicably.—*Newcastle Chronicle.*

PATENTS OF THE WEEK.

APPLICATIONS PUBLISHED.*

18,903 of 1904.—W. H. BEANES AND H. WALTON: *Hot-Water Heating Apparatus.*

This relates to a hot-water heating apparatus of the kind wherein water is caused to circulate in a pulsating or intermittent manner by alternately admitting steam under pressure to a water displacement vessel and afterwards condensing it, and consists in the use of a special steam generator of comparatively small internal capacity for producing the steam necessary for working the displacement vessel, the said steam generator being separate from the water heater employed for heating the water circulating in the pipe system. A downtake is connected to the top and bottom of the steam generator, and is arranged externally of the displacement vessel, whereby circulation of water between the steam generator and displacement vessel and the discharging of the latter vessel with hot water at or near the boiling temperature will be prevented.

20,900 of 1904.—H. C. KING: *Kitchen and like Grates.*

According to this invention a grate is provided pivoted to the rear of a frame loosely placed in the range, and at the forward extremity, centrally or at one or both sides, a rack is provided, having recesses on one of its edges, the arrangement being such that, on the uplifting of the forward edge of the grate, successive teeth of the rack engage over the edge of the grate or grate frame under the action of the weight of the rack, while the grate is lowered by displacing the rack to a determined extent, according to the degree of inclination required.

22,248 of 1904.—S. S. HELLYER: *Water-closets and the like.*

This relates to water-closets and the like, and consists in the combination of a trap having a screwed piece cast in its outlet end and a connecting piece screwed on to the said screwed piece, and turned on its outside for the attachment of the outlet pipe by a wiped joint.

* All these applications are in the stage in which opposition to the grant of Patents upon them can be made.

22,825 of 1904.—TONKS, LTD., and W. H. TONKS: *Telescopic Casement Stays.*

This invention consists in making the inner rod or arm of the stay a toothed rack or a series of corrugations, the said corrugated rod or arm being retained in its adjusted position in the outer or tubular arm of the telescopic stay by the engagement with the teeth of a saddle-like clamping piece or by an ordinary set screw.

28,320 of 1904.—J. SALT: *Chimney Tops and Flues.*

The object of this invention is to construct and arrange the flues and tops of chimneys in such a way as to prevent a down draught and insure a good up draught. For this purpose the smoke exit is in the form of a narrow slit, and chimneys and flues are arranged beneath this slit according as the requirements of the building demand. The chimney flues from the rooms lead into a space or chamber formed by the tops, which have their upper parts formed with bevel or of other suitable shape.

28,414 of 1904.—F. THEISSING: *Laying Inlaid Floors.*

This relates to a method for laying parquet floors of tiles or belts with grooves and tongues of asphalt, and consists in the combination of tiles which are supplied only on one of the long sides with a tongue, and on the other side, as well as on one or both top sides, with grooves, so that the parquet can be laid in such a manner that each of the tiles can be pushed in slantwise, with their tongues in the top side and long side of two tiles already laid, and then folded down round the tongue as axis and pressed into the asphalt without sideways shifting.

804 of 1905.—A. KIEFER: *Concrete Junction Slab having Tie Wings.*

A transversely perforated cement junction slab furnished with tie wings formed by the projecting ends at two sides of an oblong sheet of wire net work embedded with said junction slab, and such ends with a round iron bar being embedded in a wedge-shaped mass of cement mortar used between the surfaces of two of such junction slabs to join these, whereby such complete resistance to pressure and strain is obtained that a ceiling can be composed of such junction slabs apart from beams or supports of any description.

6,537 of 1905.—R. M. SOMERS: *Domestic Fireplaces.*

This relates to a fireplace in which the grate is situated below the level of the hearth, and consists in forming a downwardly sloping opening beneath the hearth proper, in direct communication with the ashpit, and providing a well containing a removable receptacle or box in the hearth immediately below the open end of the ashpit opening.

8,224 of 1905.—E. V. BAILEY: *Door Furniture.*

This relates to door furniture, and consists in providing an interlocking or separable clutch connexion between the travelling nut and the collared or enlarged foot end of the adjustable knob, and securing or retaining the parts in engagement through the medium of a rose plate, which is mounted upon the neck of the knob and is fitted to be made to bear against the back of the collar or foot thereof, so that when the said plate is secured to the door after the nut has been adjusted, and the knob applied to the spindle, the said rose plate serves as a keeper whereby the parts are rigidly locked, and constrained to turn bodily with the said spindle.

25,852 of 1904.—F. PURTON: *Fireproof Floor and Blocks therefor.*

According to the invention the hollow fire block is intended to be used with rolled steel joists, which have or can be secured to them, flanges or projections suitable for the ends of the hollow fire block to rest upon. The block is formed of armoured concrete, and is *D*-shaped in cross section, the straight part of the *D* lies horizontal and forms the base of the block, and the bow forms an arch. Projecting from each of the two sides of the base is a flange. A short portion of both ends of the block is thickened from the ground of the arch down to the outer edge of the flanges for the purpose of giving increased strength to these parts of the hollow block, and a part of the base of the blocks at the ends where they rest upon the joists is cut away or recessed, so as to allow the greater part of the base of the block to hang from the joists at a lower level than the underside of the joists.

6,350 of 1905.—H. R. ALLEN: *Partition Brick, Building Block, or Tile.*

This relates to a brick preferably of fire clay, of a desired length and thickness and glazed upon one or more sides or ends. Upon one side, preferably the top side, a longitudinal groove is formed of a desired depth and section, so as not to weaken the stability of the brick. This groove is centrally situated, and also extends along the end of the brick. At diametrically opposite parts of said brick corresponding ribs or projections are formed. These ribs or keys are somewhat less in size than the said grooves, in order to permit of a suitable binding material being employed when placing said brick in position. The ribs of one brick fit within the corresponding groove or recess in the adjacent bricks, and the brick rests upon binding material in order to secure the whole together.

7,239 of 1905.—S. ZIPKES: *Method of Making Ferro-Concrete Ceilings and the like.*

A method of making reinforced and continuous ceilings consisting of under supporting beams forming one piece with the ceiling, in which the looped reinforcement of the beams extends nearly to the upper surface of the ceiling and the looped reinforcement of the ceiling lies transverse to the bottom reinforcement, and lies with its straight part always in the part of the section exposed to tension.

9,013 of 1905.—C. DELACHARTRE: *Siphon Apparatus for Discharging Waste Waters and the like.*

An automatic elevating apparatus for the discharging or the removal of liquids, characterised by the combination with one or more reservoirs placed at the same level in proximity to the place where the discharge is to take place of another reservoir fixed near an outlet of any kind with which it communicates directly, and a tube connecting these reservoirs along a course of any kind, which tube is normally maintained filled with water in hydrostatic equilibrium, the first of these reservoirs communicating with the containers to be discharged by means of a tube bent at its end, so as to form a hydraulic seal and provided at its end with a float valve, and the reservoir communicating with the discharge being connected to the former by means of a tube, of which the end is immersed in the liquid of the said reservoir, and suitable air tubes adapted to maintain the pressure inside the said reservoirs constantly equal to the atmospheric pressure.

10,032 of 1905.—E. FRIEH and THE DEUTSCHE TEIFBOHR. ACT. GES.: *Deep-boring Apparatus.*

This relates to a deep-boring apparatus having a percussion drill and core tube, said core tube being rigidly secured to the boring rod, and a percussion drill connected with the motor within the bore hole, a slotted cross head connecting the drill to the motor, and a slotted tube passing through the cross head and connecting the core tube to the boring rod.

13,770 of 1905.—J. KING: *Street Stand Pipes.*

This relates to a street water stand pipe, provided with means whereby the rotatable swan neck delivery pipe when removed in either direction from operative position to a position parallel with the kerb of the roadway is caused to become automatically locked in each of said extreme positions, and a stuffing box connexion between the rotatable and stationary portions of the water pipe and means for preventing canting of said rotatable portion.

21,331 of 1904.—J. E. CHADWICK: *Construction of Partition Walls and Slabs for same.*

This relates to slabs and consists in making the said slabs preferably of oblong and rectangular shape. A keying ridge runs centrally along the top edge and a corresponding groove is made in the bottom edge, a similar ridge is made to extend from each end about half way, projecting from the top half at one end and from the bottom half at the other end, and these fit into corresponding grooves in the next slabs. About 2 in. on each side of the centre of the slab a vertical hole is made of 1-in. diameter for the passage of liquid cement, these holes communicate with the said groove in the bottom edge of the slab, and through to the junction of the upper slab with that below it, and will convey the liquid cement to such parts.

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SOME RECENT SALES OF PROPERTY:

ESTATE EXCHANGE REPORT.

August 21.—By SIMMONS & SONS (at Reading).

Earley, Berks.—Davis and Lower Earley Farms, 208 a. 2 r. 2 p., f.	£7,500
Upperwood Farm, 94 a. 0 r. 18 p., f.	4,400

August 23.—By THORNBORROW & Co. (at Shap).

Crosby Ravensworth, Westmorland.—Freehold farm, 73 a. 3 r. 22 p.	1,800

By SPELMANS' (at Great Yarmouth).

Burgh St Margaret, Norfolk.—Market gardener's occupation, 3 a. 0 r. 5 p., f.	310
A piece of arable and marsh land, 2 a. 3 r. 5 p., f.	178
Billockby, Norfolk.—Two enclosures of arable and marsh land, 7 a. 1 r. 37 p., f.	275

August 28.—By THOMPSON & WOOD (at Great Grimsby).

Immingham, Linc.—Various enclosures of pasture land, 175 a. 3 r. 23 p., f.	13,690

August 29.—By MAY & PHILPOT.

Brixton.—"Raleigh Lodge," Brixton-hill, f., e.r. 12*l.*	£1,300
8, Ballater-rd., u.t. 74½ yrs., g.r. 6*l.* 16s., p.	300
Streatham.—9, Leigham Court-rd., u.t. 40 yrs., g.r. 5*l.*, e.r. 12*l.*	770

By MADDISON, MILES, & MADDISON (at Reepham).

Reepham, Norfolk.—Freehold business premises, Market-pl., y.r. 56*l.*	1,000
Hackford, Norfolk.—A small holding, 6 a. 2 r. 24 p., f.	460

August 30.—By PERCY H. CLARKE.

Kentish Town.—19 and 21, Grafton-ter., u.t. 40½ yrs., g.r. 12*l.*, y.r. 96*l.* 4s.	490

Contractions used in these lists.—F.g.r. for freehold ground-rent; l.g.r. for leasehold ground-rent; i.g.r. for improved ground-rent; g.r. for ground-rent; r. for rent; f. for freehold; c. for copyhold; l. for leasehold; p. for possession; e.r. for estimated rental; w.r. for weekly rental; q.r. for quarterly rental; y.r. for yearly rental; u.t. for unexpired term; p.a. for per annum; yrs. for years; la. for lane; st. for street; rd. for road; sq. for square; pl. for place; ter. for terrace; cres. for crescent; av. for avenue; gdns. for gardens; yd. for yard; gr. for grove; b.h. for beerhouse; p.h. for public-house; o. for offices; s. for shops; ct. for court.

PRICES CURRENT OF MATERIALS.

*** Our aim in this list is to give, as far as possible, the *average* prices of materials, not necessarily the lowest. Quality and quantity obviously affect prices—a fact which should be remembered by those who make use of this information.

BRICKS, &c.

	£	s.	d.			
Hard Stocks	1	8	0	per 1000	alongside,	in river.
Bough Stocks and Grizzles	1	4	0	,,	,,	,,
Facing Stocks	2	0	0	,,	,,	,,
Shippers	2	0	0	,,	,,	,,
Flettons	1	7	0	,,	at railway depôt.	
Red Wire Cuts	1	14	0	,,	,,	,,
Best Fareham Red	3	12	0	,,	,,	,,
Best Red Pressed Ruabon Facing	5	0	0	,,	,,	,,
Best Blue Pressed Staffordshire	4	2	6	,,	,,	,,
Do. Bullnose	4	7	6	,,	,,	,,
Best Stourbridge Fire Bricks	4	0	0	,,	,,	,,
GLAZED BRICKS.						
Best White and Ivory Glazed Stretchers	12	0	0	,,	,,	,,
Headers	11	0	0	,,	,,	,,
Quoins, Bullnose, and Flats	16	0	0	,,	,,	,,
Double Stretchers	19	0	0	,,	,,	,,
Double Headers	16	0	0	,,	,,	,,
One Side and two Ends	19	0	0	,,	,,	,,
Two Sides and one End	20	0	0	,,	,,	,,
Splays, Chamferred, Squints	20	0	0	,,	,,	,,
Best Dipped Salt Glazed Stretchers, and Header	12	0	0	,,	,,	,,
Quoins, Bullnose, and Flats	14	0	0	,,	,,	,,
Double Stretchers	15	0	0	,,	,,	,,
Double Headers	14	0	0	,,	,,	,,
One Side and two Ends	15	0	0	,,	,,	,,
Two Sides and one End	15	0	0	,,	,,	,,
Splays, Chamferred, Squints	14	0	0	,,	,,	,,
Second Quality White and Dipped Salt Glazed	2	0	0	,,	less than best.	

	s.	d.		
Thames and Pit Sand	7	0	per yard,	delivered.
Thames Ballast	5	9	,,	,,
Best Portland Cement	27	0	per ton,	,,
Best Ground Blue Lias Lime	20	0	,,	,,

NOTE.—The cement or lime is exclusive of the ordinary charge for sacks.

Grey Stone Lime.....12s. 0d. per yard, delivered.
Stourbridge Fireclay in sacks 27s. 0d. per ton at rly. dpt.

STONE.

	s.	d.		
BATH STONE—delivered on road waggons, Paddington Depôt	1	6½	per ft. cube.	
Do. do. delivered on road waggons, Nine Elms Depôt	1	8½	,,	,,
PORTLAND STONE (20 ft. average)—Brown Whitbed, delivered on road waggons, Paddington depôt, Nine Elms depôt, or Pimlico Wharf	2	1	,,	,,
White Basebed, delivered on road waggons, Paddington depôt, Nine Elms depôt, or Pimlico Wharf	2	2½	,,	,,

	s.	d.		
Ancaster in blocks	1	11	per ft. cube,	delid. rly. depôt.
Beer ,,	1	6	,,	,,
Greenshill ,,	1	10	,,	,,
Darley Dale in blocks	2	4	,,	,,
Red Corsehill ,,	2	2	,,	,,
Closeburn Red Freestone	2	0	,,	,,
Red Mansfield ,,	2	4	,,	,,
YORK STONE—Robin Hood Quality.				
Scappled random blocks	2	10	,,	,,
6 in. sawn two sides landings to sizes (under 40 ft. super.)	2	3	per ft. super.	,,
6 in. rubbed two sides ditto, ditto	2	6	,,	,,
3 in. sawn two sides slabs (random sizes)	0	11½	,,	,,
2 in. to 2½ in. sawn one side slabs (random sizes)	0	7½	,,	,,
1½ in. to 2 in. ditto, ditto	0	6		

CONTRACTS.

(For some Contracts, &c., still open, but not included in this List, see previous issues.)

CONTRACTS.

Nature of Work or Materials.	By whom Advertised.	Forms of Tender, etc., supplied by	Tenders to be Delivered
2,400 yds. super. Paving, etc., Ashton to Oldham-rd.	Lancashire County Council	W. H. Schofield, County Surveyor, Preston	Sept. 12
Work at Stables, Commercial-road	Bedford Corporation	N. Greenshields, Borough Surveyor, Town Hall, Bedford	do.
Lathe, Drilling Machine, etc.	Warrington Electricity Department	F. V. L. Mathias, Boro' Elect. & Tram. Eng., Howley, Warrington	do.
Street Works	Ilford U.D.C.	H. Shaw, Engineer, Town Hall, Ilford	do.
Steel Fish Plates	East Indian Railway Co.	C. W. Young, Secretary, Nicholas-lane, E.C.	Sept. 13
Steel Fish Bolts and Nuts	do.	do.	do.
Painting Hospital Buildings	Lincoln County Hospital	W. Watkins, Surveyor, Silver-street, Lincoln	do.
Roofs & Repair, Barns, etc., Pardle Barton, Cornwood	.....	W. Pearse & Son, Surveyors, The Green, Modbury	do.
1,500 cubic yds. of Granite, Quartzite, etc.	Hythe Corporation	C. Jones, Borough Surveyor, Bank-buildings, Hythe, Kent	do.
Infant School, Cadle, near Swansea	Glamorgan County Council	T. M. Franklin, Clerk, Westgate-street, Cardiff	do.
Hot-water Plant, Aberavon Council School	do.	do.	do.
Exten. of Laundry, etc., at General Hospital, Stroud	.....	W. J. P. Marling, Hon. Sec., at the Hospital	do.
123 yds. of 9-in. Water Pipes, etc.	Padiham U.D.C.	Mr. Gregson, Engineer, Town Hall, Padiham	do.
1,700 yds. of Kentish Flints	Clacton U.D.C.	A. R. Robinson, Surveyor, Town Hall, Clacton-on-Sea	do.
Electric Lighting Cables	Stockport Gas Committee	A. J. H. Carter, Borough Electrical Engineer, Millgate, Stockport	Sept. 14
Socket and Spigot Pipes	Salford Water Committee	L. C. Evans, Town Clerk, Town Hall, Salford	do.
Wrought-Iron Tubes and Fittings	Rhondda U.D.C.	O. Thomas, Gas and Water Offices, Pentre, Glamorganshire	do.
Wiring at Council Schools, Devonshire-st., Broughton	Salford Corporation	Borough Electrical Engineer, Frederick-road, Pendleton	do.
335 ft. of 6-in. Glazed Drain Pipe, Stoke Gabriel	Totnes R.D.C.	Mr. Luscombe, Yards Farm, Stoke Gabriel	do.
Cottage on Farm at Middlecott, Devon	.....	Cook & Birmingham, Bampton-street, Tiverton	do.
Incandescent Gas Burners, Mantles, etc.	Hove Corporation	H. H. Scott, Borough Surveyor, Town Hall, Hove	do.
*NEW CLASSROOMS AT SCHOOL, CHELMSFORD	Chelmsford Grammar School	C. & W. H. Pertwee, Architects, Bank-chambers, Chelmsford	do.
Repairs to Roof Catholic Ch., Roscrea, co. Tipperary	Rev. Canon Stuart	Ashlin & Coleman, Architects, 7, Dawson-street, Dublin	Sept. 15
Main Sewerage, Bentley-with-Arksey	Doncaster R.D.C.	D. Balfour & Son, Engrs., 3, St. Nicholas-bldgs., Newc.-on-Tyne	do.
Business Premises, High-street, Elgin	.....	C. C. Doig, Architect, Elgin	do.
Alterations, etc., to Marsham School, Norwich	Norfolk Education Committee	A. J. Lacey, Architect, 6, Upper King-street, Norwich	do.
*ENGINE AND BOILER HOUSE, COAL STORE	Selby U.D.C.	P. Griffith, Engineer, 54, Parliament-street, S.W.	do.
Painting Parish Offices	Birmingham Guardians	W. H. Ward, Architect, Paradise-street, Birmingham	Sept. 16
*PULLING DOWN & ERECT. PREM., CROYDON	W. Chiesman, Esq.	W. C. Poole, Architect, Prested-road, Clapham Junction, S.W.	do.
Boiler House, etc., Rochdale-road Station	Manchester Gas Committee	J. G. Newbigging, Rochdale-road Station, Manchester	do.
Bacterial Filters, Contract No. 5	Heywood Corporation	J. Diggle, C.E., 14, Victoria-street, Westminster	do.
1,000 yds. super. of Paving Flags	Haverfordwest Town Council	J. Gibbon, Borough Surveyor, Haverfordwest	do.
Limestone Road-metalling	Briton Ferry U.D.C.	H. A. Clarke, Engineer & Surveyor, Council Offices, Briton Ferry	do.
Sewage Disposal Works at Crookhall	Consett U.D.C.	W. S. Shell, Engineer, Parliament-street, Consett	do.
Council School, etc., St. Dennis, St. Austell	Cornwall Education Committee	R. C. Andrew, Architect, Biddick's Court, St. Austell	do.
Reconstruction of Shed, Portishead Dock	Bristol Docks Committee	W. W. Squire, Engineer, Cumberland Basin, Bristol	Sept. 18
Extension of Electric Lighting	Dist. Com., Uphall and Broxburn	A. Lindsay, 11, Jamaica-street, Glasgow	do.
Sub-station Switchboards	Dublin Corporation	City Electrical Engineer, Fleet-street, Dublin	do.
Addit. Nurses' Home Block, Dudley-road Infirmary	Birmingham Guardians	W. H. Ward, Architect, Paradise-street, Birmingham	do.
Motors and Centrifugal Pumps, Durnsford-road	Wimbledon Borough Council	C. H. Cooper, Engineer, Council Offices, Broadway, Wimbledon	do.
Steel Chimney at Electric Lighting Works	Watford U.D.C.	W. H. F. Colebrook, Elec. Engineer, 14, High-street, Watford	do.
Repairs & Improvements, New Tredegar Mixed Schl.	Monmouthshire Education Com.	D. Morgan, Architect, Charles-street-chambers, Cardiff	do.
Repairs & Improvements, Infants' Council School	do.	do.	do.
Artisans' Cottages, Simsel-street Area	Southampton Corporation	C. J. Hair, Architect, 23, Portland-street, Southampton	do.
Wooden Groyne at Southend, Mumbles	Oystermouth U.D.C.	Surveyor, Park-street, Mumbles	do.
Additions, etc., to Public School, Rothes	.....	J. Wittet, Architect, Elgin, N.B.	do.
Small Relief Station, Oakfield-road, Anerley	Croydon Guardians	H. Berney, Architect, 104, George-street, Croydon	do.
Detached Residence and Stables, near Skipton	.....	J. Hartley, Architect, Skipton	do.
Surface Water Drains	Hertford Corporation	J. H. Jevons, Borough Surveyor, Hertford	Sept. 19
Making-up Streets	Acton District Council	D. J. Ebbeth, Surveyor, 57, High-street, Acton, W.	do.
Alterations, etc., to Wesleyan Methodist Ch., Seaton	.....	W. G. Scott & Co., Architects, Victoria-buildings, Workington	do.
*SUPPLY & DELIVERY OF PORTLAND CEMENT	Edmonton U.D.C.	Council's Engineer, Town Hall, Edmonton	do.
*SUPPLY & DELIVERY OF BROKEN GRANITE	do.	do.	do.
*SUPPLY & DELIVERY OF STONEWARE PIPES	do.	do.	do.
Mount Pleasant Drainage, Newburgh	Newburgh Town Council	W. D. Sang & Lockhart, Engineers, Kirkcaldy	Sept. 20
Two Pavilions, Withington Workhouse	Witeington Guardians	C. Clegg & Son, Architects, 104, King-street, Manchester	do.
Limestone, Sludge Pit, etc., at Sewage Works	Chiswick U.D.C.	J. H. Abbott, Eng., Sew. Wks., Corney-rd., Burlington-la., Chiswick	do.
*ROADMAKING, ETC., WORKS, HERTFORD	Messrs. Usher & Barclay	Norris & Duvall, 60, Fore-street, Hertford	do.
Alterations, etc., to Council School, Langtoft	East Riding Education Committee	Building Surveyor, Beverley	Sept. 21
*PUBLIC ELEMENTARY SCHOOL	Richmond Town Council	Town Clerk, Town Hall, Richmond, Surrey	do.
*REPAIRS TO INFIRMARY, PEMBROKE	Pembrokeshire, etc., Infirmary	T. H. Jones, Secretary, High-street, Haverfordwest	Sept. 23
Repair and Restora. of Exter., Shire Hall, Carmarthen	County Council	C. H. Mounsey, County Surveyor, Carmarthen	do.
*SUPPLY OF SHINGLE	Paddington Borough Council	Borough Surveyor, Town Hall, Paddington, W.	do.
Tramway Depôt in Mossley-road	Birmingham Tramways Department	F. B. Osborn, F.R.I.B.A., 13, Bennett's-hill, Birmingham	Sept. 25
Underground Convenience	Folkestone Corporation	A. E. Nichols, Borough Engineer, Folkestone	do.
*NEW LABORA., BUARTH MR., ABERYSTWYTH	University College of Wales	Registrar, at College, Aberystwyth	Sept. 26
Schools, Water-lane, Ilford, Essex	Ilford U.D.C.	C. J. Dawson, Architect, 11, Cranbrook-road, Ilford	do.
Sinking and Boring Well 900 ft.	Upton-on-Severn R.D.C.	Wilcox & Raikes, Engineers, 63, Temple-row, Birmingham	do.
*SUPPLY AND DELIVERY OF BRKN. GRANITE	Hanwell U.D.C.	Council's Offices, Hanwell, W.	do.
*REPAIRS AT CASUAL WARDS, DRURY-LANE	St. Giles-in-the-Fields, etc., Guards.	Guardians' Offices, 57, Broad-street, W.C.	do.
*ERECT. OF LAVATORIES, WRKHSE., EDGWARE	Hendon Union	Union Offices, Edgware	Sept. 27
Sewage Disposal Works, Mickleover Asylum	Derbyshire Asylums Committee	J. S. Story, County Surveyor, St. Mary's Gate, Derby	Sept. 28
Pair Semi-detached Villas, Skircoat Gr.-rd., Halifax	.....	G. Buckley & Son, Architects & Surveyors, Tower-chbrs., Halifax	do.
*FREE LIBRARY & EXTEN. TO TOWN HALL	Rhyl U.D.C.	Town Surveyor, Clwyd-street, Rhyl	Sept. 30
*ENGINEERING WK., EAST. HOS., HOMERTON	Metropolitan Asylums Board	Office of the Board, Embankment, E.C.	Oct. 3
Ten Electric and Seven Gas Lamps	Gt. & Little Usworth Parish Council	J. R. Elliott, Clerk, Fern House, New Washington, co. Durham	No date.
Vertical cast Water Mains	Rochford R.D.C.	H. T. Sidwell, Engineer, Rochford, Essex	do.
*SANAT., ALLTYMYNYDD, CARMARTHENSHIRE	.....	Office of Architect, 4, Quay-street, Carmarthen	do.
Twenty-one Cottages, Vernon-avenue, Clontarf	.....	W. H. Byrne & Son, Architects, 20, Suffolk-street, Dublin	do.

Those marked with an asterisk (*) are advertised in this number. *Competitions*, —. *Contracts*, iv. vi. viii. x. *Public Appointments*, —.

STONE (*continued*).

	s. d.	
HARD YORK—		
Scappled random blocks	3 0	per ft. cube, deld. rly. depôt.
6 in. sawn two sides, landings to sizes (under 40 ft. super.)	2 8	per ft. super. "
6 in. rubbed two sides ditto	3 0	" "
3 in. sawn two sides (slabs random sizes)	1 2	" "
2 in. self-faced random flags	0 5	" "

	s. d.	
Hopton Wood (Hard Bed) in blocks	2 0	per ft. cube. deld. rly. depôt.
" " " 6 in. sawn both sides landings	2 7	per ft. super. deld. rly. depôt.
" " " 3 in. sawn both sides random slabs	1 0	" "
" " " 2 in. do.	0 8½	" "

SLATES.

in.	in.	£	s.	d.		
20 x 10 best blue Bangor		13	2	6	per 1000 of 1200 at r. d.	
20 x 12	" "	13	17	6	"	"
20 x 10 first quality	"	13	0	0	"	"
20 x 12	" " "	13	15	0	"	"
16 x 8	" " "	7	5	0	"	"
20 x 10 best blue Portmadoc		13	12	6	"	"
16 x 8	" "	6	12	6	"	"
20 x 10 best Eureka unfading green		15	17	6	"	"
20 x 12	" "	18	7	6	"	"
18 x 10	" "	13	5	0	"	"
16 x 8	" "	10	5	0	"	"
20 x 10 permanent green		11	12	6	"	"
18 x 10	" "	9	12	6	"	"
16 x 8	" "	6	13	0	"	"

TILES.

	s. d.	
Best plain red roofing tiles	42 0	per 1000 at rly. depôt.
Hip and Valley tiles	3 7	per doz. " "
Best Broseley tiles	50 0	per 1000 " "
Do. Ornamental tiles	52 6	" " "
Hip and Valley tiles	4 0	per doz. " "
Best Buabon red, brown, or brindled do. (Edwards)	57 6	per 1000 " "
Do. Ornamental do	60 0	" " "
Hip tiles	4 0	per doz. " "
Valley tiles	3 0	" " "
Best Red or Mottled Staffordshire do. (Peakes)	51 9	per 1000 " "
Do. Ornamental do	54 6	" " "
Hip tiles	4 1	per doz. " "
Valley tiles	3 8	" " "
Best "Rosemary" brand plain tiles	48 0	per 1000 " "
Best Ornamental tiles	50 0	" " "
Hip tiles	4 0	per doz. " "
Valley tiles	3 8	" " "

TILES—(*continued*).

Best "Hartshill" brand plain tiles, sand faced.	80	0	per 1000 at rly. depôt.	
Do. pressed	47	6	„	„
Do. Ornamental do	50	0	„	„
Do. Ornamental do	4	0	per doz.	„
Hip tiles	3	6	„	„
Valley tiles	3	6	„	„

WOOD.

BUILDING WOOD,	At per standard. £	s.	d.	£	s.	d.
Deals: best 3 in. by 11 in. and 4 in. by 9 in. and 11 in	13	10	0	15	0	0
Deals: best 3 by 9	13	0	0	14	0	0
Battens: best 2½ in. by 7 in. and 8 in., and 3 in. by 7 in. and 8 in.	11	0	0	13	0	0
Battens: best 2½ by 6 and 3 by 6	0	10	0	less than 7 in. and 8 in.		
Deals: seconds	1	0	0	less than best.		
Battens: seconds	0	10	0	„	„	„
3 in. by 4 in. and 2 in. by 6 in.	9	0	0	10	0	0
3 in. by 4½ in. and 2 in. by 5 in.	8	10	0	9	10	0
Foreign Sawn Boards— 1 in. and 1¼ in. by 7 in.	0	10	0	more than battens.		
¾ in.	1	0	0	„		

	At per load of 50 ft.					
Fir timber: best middling Dantzig or Memel (average specification)	4	10	0	5	0	0
Seconds	4	0	0	4	10	0
Small timber (8 in. to 10 in.)	3	12	6	3	15	0
Small timber (6 in. to 8 in.)	3	0	0	3	10	0
Swedish balks	2	10	0	3	0	0
Pitch-pine timber (30 ft. average)	3	5	0	3	15	0

JOINERS' WOOD.	At per standard.					
White Sea: first yellow deals, 3 in. by 11 in	24	0	0	25	0	0
3 in. by 9 in.	22	0	0	23	0	0
Battens, 2½ in. and 3 in. by 7 in.	16	10	0	18	0	0
Second yellow deals, 3 in by 11 in.	18	10	0	20	0	0
„ 3 in. by 9 in.	17	10	0	19	0	0
Battens, 2½ in. and 3 in. by 7 in.	13	10	0	14	10	0
Third yellow deals, 3 in. by 11 in. and 9 in.	13	10	0	15	0	0
Battens, 2½ in. and 3 in. by 7 in.	11	0	0	13	0	0
Petersburg: first yellow deals, 3 in. by 11 in.	21	0	0	22	10	0
Do. 3 in. by 9 in.	18	0	0	19	10	0
Battens	13	10	0	15	0	0
Second yellow deals, 3 in. by 11 in.	16	0	0	17	0	0
Do. 3 in. by 9 in.	14	10	0	16	0	0
Battens	11	0	0	12	10	0
Third yellow deals, 3 in. by 11 in.	13	0	0	14	0	0
Do. 3 in. by 9 in.	12	10	0	14	0	0
Battens	10	0	0	11	0	0
White Sea and Petersburg:— First white deals, 3 in. by 11 in.	14	10	0	15	10	0
„ „ 3 in. by 9 in.	13	10	0	14	10	0
Battens	11	0	0	12	0	0
Second white deals, 3 in. by 11 in.	13	10	0	14	10	0
„ „ 3 in. by 9 in.	12	10	0	13	10	0
„ „ battens	10	0	0	11	0	0
Pitch-pine: deals	16	10	0	20	0	0
Under 2 in. thick extra	0	10	0	1	0	0
Yellow Pine—First, regular sizes	44	0	0	upwards.		
Oddments	32	0	0	„		
Seconds, regular sizes	33	0	0	„		
Yellow Pine oddments	28	0	0	„		
Kauri Pine—Planks, per ft. cube	0	3	6	0	5	0
Dantzig and Stettin Oak Logs— Large, per ft. cube	0	3	0	0	3	6
Small „ „	0	2	6	0	2	9
Wainscot Oak Logs, per ft. cube.	0	5	0	0	5	6
Dry Wainscot Oak, per ft. sup. as inch	0	0	8	0	0	9
¾ in. do. do.	0	0	7	—		
Dry Mahogany—Honduras, Tabasco, per ft. super. as inch	0	0	9	0	1	0
Selected, Figury, per ft. sup. as inch	0	1	6	0	2	6
Dry Walnut, American, per ft. sup. as inch	0	0	10	0	1	0
Teak, per load	17	0	0	22	0	0
American Whitewood Planks, per ft. cube	0	4	0	0	5	0

Prepared Flooring, etc.—	Per square.					
1 in. by 7 in. yellow, planed and shot	0	13	6	0	17	6
1 in. by 7 in. yellow, planed and matched	0	14	0	0	18	0
1¼ in. by 7 in. yellow, planed and matched	0	16	0	1	0	0
1 in. by 7 in. white, planed and shot	0	12	0	0	14	6
1 in. by 7 in. white, planed and matched	0	13	6	0	15	0
1¼ in. by 7 in. white, planed and matched	0	15	0	0	16	6
¾ in. by 7 in. yellow, matched and beaded or V-jointed brds.	0	11	0	0	13	6
1 in. by 7 in. do. do.	0	14	0	0	18	0
¾ in. by 7 in. white do. do.	0	10	0	0	11	6
1 in. by 7 in. do. do. do.	0	12	9	0	15	0

6 in. at 6d. to 9d. per square less than 7 in.

JOISTS, GIRDERS, &c.

	In London, or delivered Railway Vans, per ton. £	s.	d.		£	s.	d.
Rolled Steel Joists, ordinary sections	6	0	0	...	6	15	0
Compound Girders, ordinary sections	7	10	0	...	8	10	0
Steel Compound Stancheons	9	2	6	...	10	12	6
Angles, Tees and Channels, ordinary sections	7	10	0	...	8	10	0
Fitch Plates	7	15	0	...	8	5	0
Cast Iron Columns and Stanchions including ordinary patterns	6	12	6	...	7	15	0

METALS.

Iron—	Per ton, in London. £	s.	d.		£	s.	d.
Common Bars	7	0	0	...	7	10	0
Staffordshire Crown Bars, good merchant quality	7	10	0	...	8	0	0
Staffordshire "Marked Bars"	9	10	0	...	—		
Mild Steel Bars	8	5	0	...	8	15	0
Hoop Iron, basis price	8	15	0	...	9	0	0
„ „ Galvanized	16	10	0	...	—		

(*And upwards, according to size and gauge.)

METALS (*continued*).

	Per ton, in London. £	s.	d.		£	s.	d.
Sheet Iron, Black— Ordinary sizes to 20 g.	9	0	0	...	—		
„ „ 24 g.	10	0	0	...	—		
„ „ 26 g.	11	15	0	...	—		
Sheet Iron, Galvanised, flat, ordinary quality— Ordinary sizes—6 ft. by 2 ft. to 3 ft. to 20 g.	12	10	0	...	—		
Ordinary sizes to 22 g. and 24 g.	13	0	0	...	—		
„ „ 26 g.	14	0	0	...	—		
Sheet Iron, Galvanised, flat, best quality— Ordinary sizes to 20 g.	15	10	0	...	—		
„ „ 22 g. and 24 g.	16	0	0	...	—		
„ „ 26 g.	17	10	0	...	—		
Galvanised Corrugated Sheets— Ordinary sizes 6 ft. to 8 ft. 20 g.	12	10	0	...	—		
„ „ 22 g. and 24 g.	13	0	0	...	—		
„ „ 26 g.	13	15	0	...	—		
Best Soft Steel Sheets, 6 ft. by 2 ft. to 3 ft. by 20 g. and thicker	11	0	0	...	—		
Best Soft Steel Sheets, 22 g. & 24 g.	12	0	0	...	—		
„ „ 26 g.	13	10	0	...	—		
Cut nails, 3 in. to 6 in.	9	0	0	...	9	10	0

(Under 3 in., usual trade extras.)

LEAD, &c.	Per ton, in London. £	s.	d.		£	s.	d.
Lead—Sheet, English, 3lb. and up	17	2	6	...	—		
Pipe in coils	17	12	6	...	—		
Soil pipe	20	2	6	...	—		
Compo pipe	20	2	6	...	—		
Zinc—Sheet— Vieille Montagne ton	29	15	0	...	—		
Silesian	29	10	0	...	—		
Copper— Strong Sheet per lb.	0	0	11	...	—		
Thin „ „	0	1	0	...	—		
Copper nails „	0	0	11	...	—		
Brass— Strong Sheet „	0	0	10	...	—		
Thin „ „	0	0	11	...	—		
Tin—English Ingots „	0	1	6	...	—		
Solder—Plumbers' „	0	0	7	...	—		
Tinmen's „	0	0	8½	...	—		
Blowpipe „	0	0	1½	...	—		

ENGLISH SHEET GLASS IN CRATES.

15 oz. thirds	5½d.	per ft.	delivered.
„ fourths	2d.	„	„
21 oz. thirds	3½d.	„	„
„ fourths	3d.	„	„
26 oz. thirds	4½d.	„	„
„ fourths	3½d.	„	„
32 oz. thirds	5½d.	„	„
„ fourths	5d.	„	„
Fluted Sheet, 15 oz.	3½d.	„	„
„ 21 oz.	4½d.	„	„
¼ Hartley's Rolled Plate	2d.	„	„
⅛ „ „ „	2½d.	„	„
⅛ „ „ „	2½d.	„	„

OILS, &c.		£	s.	d.
Raw Linseed Oil in pipes	per gallon	0	1	7½
„ „ „ in barrels	„	0	1	8
„ „ „ in drums	„	0	1	10
Boiled „ „ in pipes	„	0	1	9½
„ „ „ in barrels	„	0	1	10
„ „ „ in drums	„	0	2	0
Turpentine, in barrels	„	0	3	10
„ in drums	„	0	4	0
Genuine Ground English White Lead	per ton	19	15	0
Red Lead, Dry	„	19	5	0
Best Linseed Oil Putty	per cwt.	0	6	6
Stockholm Tar	per barrel	1	19	0

VARNISHES, &c.	Per gallon. £	s.	d.
Fine Pale Oak Varnish	0	8	0
Pale Copal Oak	0	10	6
Superfine Pale Elastic Oak	0	12	6
Fine Extra Hard Church Oak	0	10	0
Superfine Hard-drying Oak, for seats of Churches	0	14	0
Fine Elastic Carriage	0	12	6
Superfine Pale Elastic Carriage	0	16	0
Fine Pale Maple	0	16	0
Finest Pale Durable Copal	0	18	0
Extra Pale French Oil	1	1	0
Eggshell Flatting Varnish	0	18	0
White Copal Enamel	1	4	0
Extra Pale Paper	0	12	0
Best Japan Gold Size	0	10	6
Best Black Japan	0	16	0
Oak and Mahogany Stain	0	9	0
Brunswick Black	0	8	6
Berlin Black	0	16	0
Knotting	0	10	0
French and Brush Polish	0	10	0

TO CORRESPONDENTS.

NOTE.—The responsibility of signed articles, letters, and papers read at meetings rests, of course, with the authors.

We cannot undertake to return rejected communications; and the Editor cannot be responsible for drawings, photographs, manuscripts, or other documents, or for models or samples, sent to or left at this office, unless he has specially asked for them.

Letters or communications (beyond mere news items) which have been duplicated for other journals are NOT DESIRED.

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All communications regarding literary and artistic matters should be addressed to THE EDITOR; those relating to advertisements and other exclusively business matters should be addressed to THE PUBLISHER, and not to the Editor.

TENDERS.

Communications for insertion under this heading should be addressed to "The Editor," and must reach us *not later than* 10 *a.m. on Thursdays.* [N.B.—We cannot publish Tenders unless authenticated either by the architect or the building-owner; and we cannot publish announcements of Tenders accepted unless the amount of the Tender is stated, nor any list in which the lowest Tender is under 100*l.*, unless in some exceptional cases and for special reasons.]

* Denotes *accepted.* † Denotes *provisionally accepted.*

BARROW-IN-FURNESS.—For constructing a sewer in Cocken-lane, for the Corporation. Mr. J. Walker Smith, Borough Engineer and Surveyor:—

J. Cleator, Abbey-road, Barrow-in-Furness* £140 17 9

BARROW-IN-FURNESS.—For constructing a steel road bridge over the Walney Channel, for the Corporation. Sir B. Baker, K.C.B., engineer, 2, Queen Square-place, Queen Anne's-mansions, Westminster, S.W.:—

Sir W. Arrol & Co., Ltd., 85, Preston-street, Glasgow* £87,900

CHISWICK.—For the construction of (1) egg-shaped concrete tube sewer, 42 in. by 30 in., about 658 yds. in length, along Chiswick Mall and New-road, to Pumping Station; (2) egg-shaped concrete tube sewer, 30 in. by 20 in. for a length of about 600 yds., 36 in. by 24 in. for a length of about 705 yds., 48 in. by 32 in. for a length of about 99 yds.; and an egg-shaped concrete tube surface-water sewer, 24 in. by 16 in., for a length of about 1,376 yds., in Duke's-avenue, the drive of Chiswick House, and Corney-road, and enlargement of sump at Sewage Disposal Works, for Chiswick Urban District Council. Mr. J. Barclay, Surveyor, Town Hall, Chiswick:—

Laying 42 in. by 30 in. Sewer along Chiswick Mall to Pumping Station.

R. W. Swaker & Co.	£4,275	0	0
H. Morecroft	4,250	0	0
C. W. Killingback & Co.	3,800	0	0
R. Wall	2,732	0	0
J. Dean & Co.	2,731	13	0
T. Watson, jun.	2,635	0	0
J. Jackson	2,511	17	11
T. W. Pedrette	2,405	0	0
G. Wimpey & Co., Hammersmith*	2,387	0	0
T. H. Macdonald	1,600	0	0

Laying Concrete Tube Sewers and Surface-water Drains along Duke's-avenue to the Pumping Station, Chiswick.

C. W. Killingback	£10,300	0	0
T. H. Macdonald	9,500	0	0
R. W. Swaker & Co.	8,865	0	0
H. Morecroft	8,850	0	0
J. Jackson	8,372	3	4
E. Wall	8,000	0	0
J. W. Dean, Ltd.	7,905	5	6
G. Wimpey & Co.	7,839	0	0
T. Watson, jun.	7,838	0	0
T. W. Pedrette, Stamford Hill*	7,450	0	0

CWMBACH.—For erecting a schoolroom in Yaysaynon, Cwmbach, Aberdare, for the trustees of Bethania Chapel. Mr. D. Morgan, surveyor, Abernantygwes, Cwmbach, Aberdare:—

M. Thomas	£827	B. Jones	£675
R. O. Jones	715	J. Jones, Gwaur Cottage, Aberaman*	662
D. S. Davies	678		

ENFIELD.—For a concrete retaining wall at the side of the Turkey-street Brook, for the Urban District Council. Mr. R. Collins, Surveyor, Public Offices, Enfield:—

Jennings & Grenfell, Waltham Cross £385

FAVERSHAM.—For erecting schools for 900 children, for the Faversham Education Committee. Mr. W. L. Grant, architect. Quantities by architect:—

Cornelius & Son	£15,590	0	0	G. Bowes	£14,325	0 0
Whiting Bros.	15,355	0	0	Ratcliff Bros.	14,050	0 0
G. Browning	14,995	0	0	T. Monk	14,031	3 9
G. Wallis & Sons	14,967	0	0	J. T. May	14,000	0 0
W. J. Adcock	14,923	0	0	W. Judges	13,938	0 0
Gann & Co.	14,844	0	0	G. H. Pettman	13,834	0 0
Hayward & Paramor	14,749	0	0	Fuller & Reeve	13,750	0 0
Wise	14,475	0	0	A. S. Ingleton, Herne Bay*	13,583	15 7

FLEUR-DE-LIS.—For erecting twenty houses for the Buttry Hatch Building Club. Mr. C. Telford Evans, architect, 8, Queen-street, Cardiff:—

E. Hughes, Fleur-de-Lis, Cardiff £3,060

GLOUCESTER.—For George-street Branch Post Office extension:—

		Cr.	
W. Bowers & Co.	£2,950	£116	;
A. J. Colborne	3,189	215	
A. S. Cooke	3,280	145	
W. Jones	3,350	130	
J. Byard & Sons	3,465	210	
A. Estcourt & Sons	3,447	147	
W. E. Blake	3,445	135	
J. Gurney	3,700	180	
A. E. Denby & Co.	3,900	150	
A. King & Sons	4,582	200	
R. Wilkins & Sons	4,689	171	

GRIMSBY.—For convalescent wards, etc., at Grimsby and District Hospital, for the Amalgamated Friendly and Trade Societies' Gala Committee. Mr. H. C. Scaping, architect, Grimsby:—

J. A. Thomas	£921	15	9
G. & J. Smith	850	8	5
Cook	812	10	8
Hewins & Goodbund	791	0	0
Holmes & Richardson	787	10	0
Waterman	£774	3	0
Kitching	766	13	4
Gilbert & Kirton	764	0	0
H. Marrows, 84, Garden-st., Grimsby*	744	2	11

GRIMSBY.—For erection of Sunday School and internal alterations to Baptist Church, Freeman-street. Messrs. Garside & Pennington, architects, Ropergate, Pontefract. Quantities by architects :—
Benings & Goodband, Grimsby* £1,377

ILFORD.—For additional stabling at depôt, Ley-street, for the Urban District Council. Mr. H. Shaw, Surveyor, Town Hall, Ilford :—
T. & A. Willmott, The Hill, High-road, Ilford* £218

KINGSTOWN.—For laying a 6-in. water main at Glenageary, for the Urban District Council. Mr. J. Berry, Surveyor, Town Hall, Kingstown. Quantities by Surveyor :—
J. Kelly, Newbridge, Ireland..... £498 12 6

KIRTON (Lincs.).—For lengthening the Market Stead Bridge, for the Holland County Council. Mr. L. Starkie, District Main Road Surveyor, Wellington House, Skirbeck :—
Sherwin & Son, Boston..... £170

LLANDAFF.—For providing and laying 400 yds. of Newbridge stone kerbing in Cardiff-road, for the Llandaff and Dinas Powis Rural District Council. Mr. J. Holden, Surveyor, Park House, 20, Park-place, Cardiff :—

Maggs & Co. ..	£105 15 0	Osmond & Sons	£78 10 0
J. C. Evans ..	104 12 6	J. Ashley	76 9 2
T. R. Williams.	79 8 4	C. Davies	64 3 4

For 100 lineal yds. of 9-in. Earthenware Pipe Sewer, etc., Highwalls, Dinas Powis.

J. Ashley	£205 11 5	C. Davies	£110 11 11
Maggs & Co...	165 5 3	W. Ball	108 6 8
C. Osmond ..	152 6 11	J. Britton, Dinas Powis, Glam.*	80 8 9
J. Brock	128 19 6		
J. C. Evans ..	127 19 10		

MERTHYR TYDFIL.—For alterations to Aberdare training schools, for the Merthyr Tydfil Guardians. Mr. T. Roderick, architect, Clifton-street, Aberdare. Quantities by architect :—

M. Thomas	£219 0	D. Davies, Aber-dare*	£179 11
D. Rees	210 0		

NOTTINGHAM.—For houses, Derby-grove, Derby-road :—
W. & J. Simons‡ £911
[‡ Lowest of ten tenders received.]

NOTTINGHAM.—For house, Lucknow-drive, Mapperly Park. Messrs. A. R. Calvert & W. R. Gleave, architects, 18, Low-pavement, Nottingham :—
G. Hopewell & Sons‡ £980
[‡ Lowest of ten tenders received.]

SCROPTON.—For laying 330 lineal yds. of 9-in. pipe sewer and 108 yds. of 6-in. pipes, etc., for the Repton Rural District Council. Mr. F. W. Bullock, Surveyor, Egginton, near Burton-on-Trent :—

H. Bennett ..	£216 6 10	T. Radford ..	£185 0 0
J. & J. Warner	205 0 0	J. Blood, Hatton*	171 8 9
Brown & Son	190 5 5	R. Goodwin ..	140 0 0
W. Wood	185 0 0		

SHEFFIELD.—For erecting training college hostel, Collegiate-crescent. Messrs. Gibbs & Flockton, architects, 15, St. James's-row, Sheffield :—

Armitage & Hodgson	£11,869 0 0
W. Moss & Son, Ltd.	11,550 0 0
J. T. Wright.....	11,454 0 0
G. Carr	11,000 0 0
J. Ecclesby & Son	10,925 0 0
Dyson & Son	10,914 10 0
T. Lowe & Sons	10,790 0 0
H. Turton	10,615 0 0
W. & A. Forsdike	10,580 0 0
T. & H. Wheen	10,580 0 0
G. Longden & Son, Ltd.	10,497 11 0
J. Fidler, Ltd.	10,350 0 0
J. Wilkinson & Sons	10,350 0 0
Ash, Son, & Biggin, Ltd.	10,260 0 0
H. Bumby & Son	10,255 0 0
Dawson, Jones, & Co.	10,209 10 6
J. Mastin & Son	10,175 0 0
H. Boot & Son	10,160 0 0
D. O'Neill & Son.....	9,962 0 0
T. Roger & Son, Ltd., Sheffield*	9,905 0 0

SOUTH MOLTON.—For new isolation ward at the Workhouse, South Molton, North Devon, for the Guardians of the South Molton Union. Mr. Fred. F. J. Sanders, architect and surveyor, 6, New-road, South Molton :—

J. Westacott....	£232 0	W. Sanders & Son	£205 0
F. A. Hooper....	229 10	W. Parsons, Chulmleigh* ..	199 18
J. Southwood....	210 0		

WHITCHURCH.—For private street improvement works, Belle Vue-crescent and Hawthorn-road, for the Llandaff and Dinas Powis Rural District Council. Mr. J. Holden, Surveyor, Park House, 20, Park-place, Cardiff :—

S. Hewlett	£977 2 4	E. Osmond & Sons	£788 8 3
S. Shall	923 15 7	F. Ashley	769 15 4
J. Broch.....	922 18 6	T. R. Williams, Cardiff*	734 4 4
C. Davies	810 6 5		

WHITCHURCH.—For private street improvement works, Hawthorn-road West, Hazelhurst-road, and two back lanes, for the Llandaff and Dinas Powis Rural District Council. Mr J. Holden, Surveyor, Park House, 20, Park-place, Cardiff :—

J. Broch ..	£1,072 19 0	J. Ashley ..	£8:9 2 4
S. Hewlett..	1,063 1 5	T. R. Williams, Cardiff*	831 11 8
S. Shall	1,032 13 10		
C. Davies ..	919 3 1		
C. Osmond & Sons ..	905 18 4		

WHITCHURCH.—For private street improvements in Evansfield-road and two back lanes, for the Llandaff and Dinas Powis Rural District Council. Mr. J. Holden, Surveyor, Park House, 20, Park-place, Cardiff :—

J. Broch.....	£721 0 3	C. Davies	£600 18 5
S. Shall	667 3 9	F. Ashley	554 15 0
S. Hewlett....	665 1 9	J. R. Williams, Cardiff*	537 8 2
J. Rees	615 4 8		

WHITCHURCH.—For private street improvement works in West-road, for the Llandaff and Dinas Powis Rural District Council. Mr. J. Holden, Surveyor, Park House, 20, Park-place, Cardiff :—

S. Hewlett....	£570 10 3	E. Osmond & Sons	£432 11 6
S. Shall	567 3 3	J. R. Williams, Cardiff*	431 15 3
J. Broch.....	558 8 0		
C. Davies	494 5 4		
F. Ashley	452 10 6		

WIMBLEDON.—For erecting ten small villas, Chatsworth-avenue, Kingston-road, for the Polytechnic Estate, Ltd. Mr. W. C. Poole, architect, Prested-road, Clapham Junction :—

Cropley Bros., Ltd.	£5,868 0	T. B. Campion .	£3,641 0
P. B. Evans & Co.	5,171 0	F. W. Harris & Co., Ltd.....	3,570 0
A. G. Crisp....	4,900 0	J. C. Russell ..	3,510 0
S. N. Soole	4,700 0	G. Douglas	3,427 10
F. D. Hidden..	4,662 0	H. Coombs & Sons	3,420 0
G. W. Eyles ...	4,510 0	W. Roberts....	3,390 0
Batten Bros. ..	4,480 0	A. Ray	3,300 0
J. Barker & Co.	4,370 0	Hall & Jacobs .	3,128 0
Jones Bros.....	3,851 0	R. N. Marrable.	3,067 0
J. E. Saunders .	3,840 13	H. E. H. Buckingham	3,050 0
F. Kinnaird ..	3 794 0	Harbour & English, Southend-on-Sea* ..	2,828 0
G. Richardson .	3,705 0		
B. Mimmack ..	3,704 0		
T. B. Hope....	3,660 0		

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